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The Dynamics of Collective Farming: A Case Study of Fish Farm Cooperatives in the Prefectures of Butare and Gikongoro, Rwanda.

Alphonse Rubagumya

Louisiana State University and Agricultural & Mechanical College

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**The dynamics of collective farming: A case study of fish farm
cooperatives in the prefectures of Butare and Gikongoro,
Rwanda**

Rubagumya, Alphonse, Ph.D.

The Louisiana State University and Agricultural and Mechanical Col., 1993

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Ann Arbor, MI 48106**

THE DYNAMICS OF COLLECTIVE FARMING:
A CASE STUDY OF FISH FARM COOPERATIVES IN
THE PREFECTURES OF BUTARE AND GIKONGORO, RWANDA

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Sociology

by

Alphonse Rubagumya

B.A., Université Nationale du Rwanda, 1982
M.A., Louisiana State University, 1987

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ABSTRACT

Cooperative fish farming not only insures a wider distribution of land and fish farming technology resources to larger segments of the population, but also makes possible the integration of limited individual resources into sizable and economically more viable production and marketing units. On the basis that more efficient internal organization can lead to greater cooperative performance, the purpose of this study is to identify organizational attributes and practices associated with effectiveness of fish farming cooperatives in Rwanda.

Data for the study were obtained from a sample of 200 fish farm groups selected in the prefectures of Butare and Gikongoro, Rwanda. Information on the characteristics of each group was gathered from three of its leaders. Regression analyses were used to test the association between structural characteristics and organizational practices and the performance of the cooperatives. Given the magnitude of the Beta coefficients, the following variables were found to significantly and positively affect production levels: 1) the length of time groups have been together doing fish farming business; 2) democratic leadership style; 3) the extent to which each member does all pond management operations, on a rotational basis; 4) the frequency of reports made by the control and supervision boards; 5) the number of members who are 26-45 years old; 6) the degree of family ties among

members; 7) membership size; and 8) the extent to which groups implement arrangements designed to compensate for failure to provide labor contributions. In order of their importance, the following variables were found to influence sustainability: 1) the extent to which each member does all pond management operations on a rotational basis; the frequency of general assembly meetings; 3) the length of time members have been together doing fish farming business; 4) the number of 25-46 years old members; 5) membership size; and 6) the extent of friendship among members.

A number of recommendations for the development and improvement of fish farm cooperatives were derived from the findings of the study.

Chapter 1

INTRODUCTION

1.1. Agricultural Cooperatives in the Development Process

Development is a highly complex process involving the allocation and activation of material and technological, and human resources. Agricultural development has meant the diffusion, into farming communities, of new high-yield technologies, and more efficient methods of production, in an effort to enhance agricultural production and productivity (Long, 1977). Increased production insures food and income security. A complementary aspect of the development approach involves the need to forge policies and institutions which will guarantee that the largest number of farmers get a piece of the development benefits pie. The strategy is then to improve farmer productivity and production organization within the context of more redistributive institutional systems. Organizing farmers in cooperatives, in which farmers collectively provide production means and share the final benefits, is often suggested as a convenient medium to transfer innovations, while making a large portion of the population accountable for their own progress (West, 1983). Instead of being directly delivered to the individual, technology is transferred through cooperatives, which are to be seen as mediating structures that link the farming community and government institutions in control of rural development services (Esman and Uphoff, 1984).

Owing to their organizational structure and their working philosophy, agricultural cooperatives can facilitate the process of rural development by insuring an equitable income distribution, and promoting self-help initiatives and efforts within farming communities (Abatena, 1987; Young et al., 1981). In cooperatives, farmers supply part or the entire bulk of human, material, and managerial resources needed for production purposes. Subsequently, the cooperative movement can be seen as one step forward towards a development strategy designed to make farmers responsible for their own advancement.

Many resource-short countries promote the cooperative movement as a matter of public policy choice, because of their economic efficiency, and particularly as a social and political safety valve. The potential of collective action as one organizational form useful in the development process has been described by Kloppenburg in the following general terms:

"..., technical considerations may necessitate group approaches, or the factors of equitability and social justice may impel governments or donor agencies to require communal action as a prerequisite for various forms of subsidy. At the level of the farmer himself, the advantage of collective enterprise can be summed up simply and succinctly by saying, as field staff now do, that working in a group is cheaper and easier than working alone. Cheaper because costs can be spread and economies of scale achieved; and easier because labor, skills, ideas, expertise, and inputs can be shared and exchanged. Group action permits maximal and most effective use to be made of scarce resources (Kloppenburg, 1983:315)."

In many developing countries the role of agricultural cooperatives is crucial because their effective operation has the potential to promote development, given the conditions of resources' scarcity in which they are created, and given the scope and importance of the functions they are assigned to perform. The problem then is to find cooperative organizational structures that best channel development resources and efforts, given the premise that efficiency of organizational framework can determine whether or not social and economic development can occur.

In Rwanda, Central Africa, many small self-help farmer cooperatives are beginning to emerge in response to the high costs of farming, scarcity of agricultural resources, and economic and food demand of increasing population growth and density. Farmers collectively engage in various economic activities. They themselves provide the labor, money, equipment, and other necessary means for the production and marketing of their produce. They share the profits according to rules set forth by group members themselves. Collective activities are additional sources of family or personal income, because every family usually has one or several plots of land on which food items are grown during appropriate seasons. A recent inventory found a total of 3,238 rural cooperative enterprises in the 10 districts comprising Rwanda (Ntavyohanyuma, 1987). The same inventory points out that 2,731 or 84% of those cooperatives

were created within the last ten years. The strikingly recent proliferation of agricultural and livestock oriented collective activities reflects the interest associated with the cooperative movement in Rwanda. That interest is felt in the policy-making sphere. Laws have been enacted to regulate the organization and functioning of cooperatives; a Ministry of Cooperative Movement has been created to administer policies regarding the conduct of cooperative associations; speeches and information programs are often broadcasted on the radio to promote and teach farmers about the importance of cooperatives; and government officers are appointed in each commune to deal with cooperative matters at the local level.

All those measures reflect the utmost importance and salience of cooperative activities in the social life of Rwandans today. Furthermore, they instigate the scientific curiosity to analyze the social and economic viability of agricultural cooperative enterprises as efficient production systems and development tools.

One type of cooperative which has developed within the past ten years is the fish farm cooperative, comprised of small groups of farmers engaged in fish production as a collective enterprise. The main goal of this dissertation is to investigate the structural and organizational factors of success in fish farm cooperatives.

1.2. Production Enhancement and Sustainability in Fish Farming Activities

Aquacultural activities are promoted, thanks to the financial, technical, and material assistance from both the Rwandan Government and the United States Agency for International Development, in their joint efforts to insure Rwanda's food security, and improve the national nutritional status deteriorated by serious problems of protein shortage (Grivetti, 1982). Besides, fish farming offers to Rwandan peasants a new supplementary productive activity from which they can enhance their income (Molnar and Rubagumya, 1988). Fish culture activities are relatively new enterprises in Rwanda. The Rwandan Fish Culture Project does the operational administration work related to their promotion, extension and supervision.

Among the 2,879 ponds operational in 1990, 1950 or 67% were collectively owned. Group fish farming begins when individual farmers, men and/or women, old and/or young, decide to form a collective enterprise. They then approach appropriate local authorities for the allocation of land. Allocated lands are valley lands which remain government property (FAO, 1988). Even though groups are made up of individual farmers, they indirectly can be seen as joint-enterprises involving groups and families or group members. Indeed, family members are at one time or another, involved with group activities when, for example, they are

asked to provide labor contributions for a member who is sick, or has another urgent engagement. Those cooperative groups feature the collective ownership of all the means of production, including land, joint farming, productive labor, management, and decision-making. Cooperative members are responsible for the construction of the pond, filling it with water, reproducing fingerlings, collecting animal fertilizer and vegetables to feed the fish, and keeping up with maintenance activities on the pond. Group members elect their own officials who supervise the arrangements of work, the distribution of dividends, the maintenance of records, and the marketing of the harvest. The group can expel any member who fails to comply with its obligations. And the possibility exists for the expulsion of any member whose expectations are not satisfied by the group operations. Farmers provide labor and time both in daily operative decisions and activities. The group fish farming system has some features of a genuine grassroots participation in development, whereby the farmers are meaningfully involved in the decision-making, and in the execution of activities.

As policy instruments for delivering fish technologies to farmers, cooperatives offer several administrative, economic, and social advantages for planned fish production activities. Firstly, cooperatives help cope with the difficult task of reaching larger numbers of farmers for

government support programs and intervention strategies (Dorner, 1977; Bennett, 1983; Molnar and Rubagumya, 1988). They facilitate effective resources mobilization and management. Indeed, the extension work, service provision, supervision, follow-up, and the overall development administration can be enhanced, because, through groups, a larger number of farmers can be reached more efficiently and more quickly (Oxby, 1983). At the same time, they facilitate the distribution of income, food and agricultural production, and the expansion of rural employment opportunities (Dorner, 1977). Collective pond operations can satisfy several farmers and their families, defusing controversies and tensions which might occur when communal property is granted to individual holders (Molnar and Rubagumya, 1988). Furthermore, cooperative affiliation is often a required condition to get access to government services, including land and fish technology. That is because, contrary to individual operations, joint responsibility can provide better collateral assurances for repaying the credit and accepting input supplies (World Bank, 1975).

Collective fish farming constitutes a sound economic move for many operators. It offers special advantages to the small farmer, given the bulk of work and means required for fish production. In effect, pulling resources, such as land, productive labor, time, and equipments, can be particularly

beneficial where individual, scarce and limited resources hamper efforts to meet economic and production needs. Fish production operations, including digging a pond, collecting feeds and feeding the fish on a daily basis, collecting fertilizers to put into the pond, maintaining adequate water level in the pond, harvesting, sharing, and selling the harvested fish, demand a heavy load of work that cannot be easily sustained by an individual operator, but rather by several contributors. Additionally, cooperatives offer some flexibility in the organization of work by facilitating substitution mechanisms for members who, because of sickness or other reasons, fail to provide their contributions to the enterprise. Furthermore cooperatives offer a special marketing advantage, by eliminating the middleman. Through concerted marketing, farmers in cooperatives can better enhance their bargaining position in selling their produce, as opposed to the likelihood of individual operators engaging in counter-productive competitive actions (Roy, 1981; Savage, 1989). Concerted marketing actions are particularly needed for marketing fish, a highly perishable good that needs to be sold without delay. Cooperatives are a favorable setting for farmers to practice partial-harvesting, supplying to the market only the right quantity that can be sold without unwanted deflation on prices (Molnar et al, 1990; Molnar et

al., 1993). Uncontrolled individual supplies risk to overflow the market, effecting declines in prices of fish.

Two main goals are pursued through the institution of fish farming as promoted by the Rwanda Fish Culture Project (RFCP). Firstly, fish farm groups supervised by the RFCP are directly involved in fish production activities. Members are mobilized and activated for the achievement of economic gains in the form of **enhancement of fish production**, expanding their food and income security. Secondly, one long-term objective of the RFCP is to stimulate farmers' self-help efforts and self-sufficiency. This goal reflects concerns over the **sustainability** of newly introduced technologies in farming communities. The ultimate intention is one of setting into motion an adoption process through which farmers build up skills, and technical knowledge necessary to shape their fish farming capability in such a way that they could do fish farming without outside instruction and supervision by the RFCP extension service. This requires that farmers by themselves be able to produce their seed stock (fingerlings), and proficiently perform all pond management operations (Molnar et al., 1991; Molnar et al., 1993). Farmers will have then acquired enough skills and know-how to enable them to fish farm without necessarily turning to RFCP for assistance.

If farmers can do this on a sustained and continued basis, the RFCP will have accomplished its objectives.

Those two objectives outline major concerns of development strategies today. One prevalent feature of development undertakings in developing countries is the fact that they mostly remain initiated, organized, and operated outside the rural farming community, in the form of direct intervention by government or international donors. The outside assistance has become so important that questions are often raised to know what happens to the innovation and the whole development enterprise once, for one reason or another, the aid is suspended. Innovations are used in order to enhance agricultural production and productivity. Furthermore, development policy-makers and practitioners worry about the sustainability of newly introduced technologies. Farmers must be made capable of using the technology even without outside assistance. To do so, minimum conditions must exist. First, the nature of the innovation must remain relatively simple, less expensive, and adaptable to the local social and physical environment (Molnar et al., 1985; Rogers, 1983). Second, farmers must be able to adopt the innovation and find a niche for it in their farming and production system.

In Rwanda where the cooperative institution is the selected framework for intervention in fish culture

development, all the integral parts of that established system of production must contribute in supporting and orienting action in such a way that the two objectives are reached. Otherwise, the undertaking can be considered a failure, at least in the long-run.

1.3. Statement of the Problem

With regard to their organization, fish farm cooperatives discussed in this study represent a special case of collective activities. Indeed, their social and organizational characteristics distinguish them from mainstream productive cooperatives. Pond fish production activities must be distinguished from other aquatic activities whereby fish is captured from lakes, rivers, or seas. As Pollnac (1991:260-261) and Pollnac and Poggie (1991) point out, work organization, manpower and capital requirements, and labor arrangements make the difference between aquaculture and capture fishery. In aquaculture, fish practically grow in man-controlled environments where fish must be fed, cared for, and the whole production system maintained. Pollnac (1991) notes that aquacultural activities demand relatively more time and capital investment. They also require intense labor arrangements for digging the pond, feeding fish, fertilizing the pond, maintaining adequate water level and quality, and harvesting. In contrast,

captured fish grows in natural environments. Collective activities cooperatives' members engage in are centered around capturing and marketing the captured fish. Compared to fish pond activities, capture fishing demands less complex organization and relatively low capital investment (Pollnac, 1991).

Furthermore, small-scale, self-managed grassroots cooperatives such as fish farm cooperatives in Rwanda differ from mainstream large-scale agricultural production cooperatives. Here the main difference lies in their organizational management. While fish farm cooperatives are basically run by members themselves who elect leaders from their own group, daily execution of activities in most other types of production cooperatives is usually done by professional managers. Members' cooperation is practically limited to providing monetary or agricultural items, and participating in meetings (Nzabahimana, 1986). As professionals, managers are not necessarily members of the cooperatives. They are individuals hired to do the job. In addition, they usually are trained and possess the managerial and organizational skills to deal with clients and marketing contingencies within their organizations. The professional management aspect brings in another level in the organization of cooperative activities. Lack of it raises serious problems of work organization, division of labor, and managerial

viability in fish farm cooperatives in which members are expected to possess less administrative knowledge, given their low levels of education.

The lack of a professional management apparatus, the social relations of production linked to the relatively great amount of time and material cooperation in fish pond cooperatives, and the task requirements associated with fish pond production technology, challenge fish farm collectives with special managerial and organizational demands. The effectiveness of fish farm groups as development instruments is directly tied to their ability to implement effective work patterns whereby members' manpower is fully mobilized, the fish production technology is properly applied, and all fish pond operations are efficiently coordinated.

The administration of fish farmer cooperatives is hampered by one major organizational dilemma that defies the conventional rules of decision-making in organizations: the lack of a traditional base of central authority which is an important element in organizational dynamics. Cooperatives are established for the purpose of doing business. For that reason, they are faced with much the same business and administrative requirements as are other forms of business organizations (McBride, 1985). However, cooperatives are unique forms of business organizations because of their structural and organizational arrangements. Contrary to non-

cooperative businesses in which the owner, the manager, the users, and the workers usually are separate entities, members of cooperative associations simultaneously combine the qualities of owners and users. In production cooperatives, members add the qualities of managers and workers. Cooperatives are owned by their members who are the users (customers), managers, and workers.

Fish farm cooperatives encourage formal democracy in the structure of the enterprise in that they are characterized by a substantial provision for members' participation in decision-making. However, member's involvement and the whole notion that every member is responsible as a decision-maker and manager can lead to a situation where, in practice, no one is responsible for implementing decisions. Given their organizational structures, farmer cooperatives are subject to internal dilemmas that can hamper their successfulness. Fish production cooperatives are production units, similar to family farms, farm businesses, state farms, or government-sponsored farm projects. However, the democratic control through the implementation of the one-man, one vote principle, the emphasis on egalitarianism, the combination by the members of the qualities of membership, ownership, usership, employeeship, and managership at the same time, lead to the portrayal of production cooperatives as groups in

which economic activities and functions have to be carried out in the absence of any central authority to coordinate or direct the activities (Roy, 1981).

Indeed, the production cooperative farm does not have the advantage of the socially implicit authority invested in the head of the household in a family farm (Molnar et al., 1985). The job of the household head in a family farm is facilitated by the authority he (she) uses in his (her) executive and coordinative functions, and in providing orders to family laborers or hired manpower. On the other hand, the cooperative farm does not benefit from the institutionalized central authority found in corporate farm businesses or in agricultural projects where specific, formal bureaucratic structures define vertical flows of authority and communication. The lack of a conclusive decision-making body, together with the dual role of group members, both as workers and managers, can be conducive to conflict of identity and conflict in work relations (Sira and Craig, 1989). As owner-manager, a member enjoys decision-making rights, while as worker, he (she) has work obligations when carrying out decisions. As workers, however, all members may not be at the same level, because some will hold managerial functions involving giving orders, while others will have to take those orders. A conflict may rise when orders from "a fellow-member" are not always accepted (Sira and Craig, 1989). In

fact, production cooperatives lack the advantage of an administrative hierarchy found to be instrumental in controlling, organizing and coordinating the work, and solving conflicts within the organization (Blau, 1974).

Hard work, work discipline, and commitment to group activities from all group members are necessary for the economic, social and organizational vitality of the group. This, however, cannot be taken for granted, especially in the absence of individual incentives. Elected representatives are expected to provide both managerial time and guidance efforts for no pay. Except for intangible rewards, such as prestige and social approval in the community, they do not receive any financial or material rewards in the form of honoraria as recognition for their services rendered to the common cause. In the long-run the provision of free time and efforts may not be possible, given other family and community responsibilities cooperatives' representatives may have. Voluntarism on which the cooperative spirit is based may not alone be sufficient to build commitment (Sira and Craig, 1989).

Structural arrangements in collectives are conducive to the danger of "free-riding", involving single members' tendency to rely on the work of others. "Free-riding" particularly occurs in public goods when all the actors can consume some portion of the good, and their consumption is

independent of their particular contribution in the provision and maintenance of the good (Olson, 1965). In fish farm cooperatives the "free-riding" likelihood is evidenced by the fact that, while the fish harvest is divided in equal shares among all the group members, contributions to the collective are not necessarily equal. During the pre-dissertation field research conducted in Rwanda in the Summer of 1989, for instance, it was observed that no account was made of how much input provision and time maintenance each particular member provided to the collective. Actually some members may be contributing more than others. To the extent that the benefits of the good are not denied to those who do not help bear the same costs, a rational member will want to enjoy his (her) share of the harvest with less participation in contributions. The problem of "free-riding" acts as a deterrent to collective action since reduced members' participation can in the short-run lead to suboptimal production levels, and in the long-run it can provoke the dissolution of the group when committed members quit avoiding to be taken advantage of (Yamagishi, 1986).

Some social organization with sanctions is necessary to control free riders. Farmers indicated that three types of penalties are applied whenever, for one reason or another, a member fails to provide his (her) share of labor in the communal enterprise at established times. First, the

delinquent is asked to pay a fine in money equal to the institutionalized local value of the manual labor which gravitates around 100 Rwandan francs for the morning work, and around 50 Rwandan francs for the afternoon work. Second, delinquents are asked to pay their dues in the same amount of labor at another agreed upon time. Thirdly, it is sometimes accepted that a member be replaced by somebody else (usually a member of the family) to provide the share of collective labor. The adoption of those compliance measures is important for the strengthening of the organization. However, the reliance upon them can undermine the economic performance, as they cannot fully and effectively replace the work of the member who did not show up. Indeed, the use of a family member cannot be substituted for a monetary fine or postponed work. Also, the use of a family member disguises the importance of the group member's work to the collective enterprise, given differences in fish farming skills between the group member who benefitted from extension services, and a family member who did not. There may be differences in skills, incentives, and physical energy to do the work.

To summarize, fish farm cooperatives suffer from several inadequate organizational elements, including: 1) the lack of bureaucratic structures to direct authority and communication; 2) unclear distinction between the managership

and the subordinates; 3) the lack of a decisive authority body; 4) inefficient sanctions-system to secure work discipline, commitment to the organization activities, and insure compliance with collective requirements; 5) the absence of efficient incentives-system to reward extraordinary efforts; and 6) the susceptibility to the free-riding phenomenon. Those dilemmas raise organizational and managerial issues that can undermine the relative efficiency of fish farm cooperatives. The presence of these dilemmas appears to point to the existence of contradictions between, on one side, the economic and business mission cooperatives are assigned, and, on the other side, the institutional and organizational structure designed to carry out that mission. If group fish farming continues to enjoy substantial popularity as suggested by the growing number group pond operations (Molnar et al., 1993), remedial mechanisms must be operating. Given unorthodox features of cooperatives as production organizations, efforts to find answers to their dilemmas prompt the need to undertake an inquiry into the internal organizational system of fish farm groups, exploring their administrative characteristics, structure, and membership, and their relationships to group performance. The underlying premise is that the internal dynamics of the groups will have a great deal to do with the quality of management and overall success of the farm enterprise.

1.4. Objectives of the Study

The study examines how the structure/organization of fish farm cooperatives is associated with success in achieving the desired goals. More specifically, the study attempts to determine the structural factors of organization in fish farm cooperatives that influence their productivity and farmers' self-sufficiency in conducting fish farming operations.

Cooperatives provide a useful organizational means for the attainment of goals through collective action. Farmers collectively organize to provide time and labor, use their skills, dig the pond, maintain it, feed the fish, divide the harvest and dividends, market the fish, reinforce participation rules, and so forth. The patterns of social organization, decision-making, conflict management, and cooperation which group members establish to maintain the fish farm facility affect the institutions's ability to fulfill its objectives. The fundamental premise is that efficient groups have effectively organized a dynamic decision-making system that is useful in enforcing rules for pursuing the collective benefit. Similarly, deficiencies in collective productivity can be attributed to deficiencies in social organization.

This study is intended to elicit the social context which shapes the internal structure, social and economic

exchanges among members, and social relations of production in fish farm groups. On one side, organizational features shape the nature of social control that is useful in ensuring members' compliance with the organizational goals. On the other side, organizational characteristics in cooperatives determine group cohesion, members' attitudes toward cooperative/mutual action and benefit, and commitment to collective work. Directly and/or indirectly those organizational characteristics are associated with group viability by shaping conditions and circumstances that are propitious for achieving the objectives of the organization.

1.5. Significance of the Study

No empirical study has thus far been conducted on the structural organization of small-scale fish pond cooperatives in Rwanda. Previous work focused on factors of success and failure of commercial and marketing cooperatives and capture fishing groups (Bahigiki, 1989). Those cooperatives in many respects differ from fish farm groups investigated in this study. The dual role of members both as contributors and decision-makers make fish farm groups a special case among cooperative organizations. Besides, fish farm production technology requires a different set of work relations and organizational arrangements. Most conclusions of past cooperative research cannot be referred to for fish farm collectives. Here,

particular attention is focused on studying the organization of cooperatives that are run by members themselves.

This study has several implications for those who have developed special interests in widening their understanding of the social fabric in grassroots community groups and those engaged in designing rural development policies. Indeed, fish farm cooperatives offer a good laboratory for studying social structure and social relationships of work among one particular category of people with extremely low levels of education and financial means: small farmers. As such, this study provides not only a useful setting and basis for comparative evaluations of conditions and processes of collective adoption of technological innovations (West, 1983), but also the possibility of putting significant aspects of exchange and organizational theories to empirical test. Therefore, the study will help reconfirm or disprove previous findings and accepted principles about collective decision-making, broadening or reducing the scope of theorization about organized social action in general, and in grassroots collective organization for production in particular.

Because cooperatives are the central vehicles through which fish production technology is delivered in Rwanda, it is imperative to better understand how the organizational

structure of cooperatives relates to the technological, economic, and social factors of fish production. The success of fish farm cooperatives is a function of their ability to establish effective self-governance mechanisms whereby members are brought to provide their time, labor, and material share in accordance with the pond management requirements. It is only with the full contribution of each and every member that a cooperative can enhance its productivity levels and sustainability capacity. Therefore, a study of organizational dynamics of fish farm groups is intended to provide a better understanding of some major factors of fish production. An inquiry into the dynamics of collective action directs one to reassess the suitability and practicality of using cooperative institutions as a useful and efficient framework to promote economic and productive activities. Indeed, there cannot be success for a cooperative if its members do not cooperate and comply with the enterprise's requirements. But, when they do and the cooperative prospers, then its success implies a successful development for its members in particular, and for the whole country in general.

Likewise, this study is important because fish culture has raised so many expectations both from the Rwandan government and the United States Agency for International Development who, attracted by the dietary/proteinic and

economic value of fish, have invested a lot of capital in the undertaking. They need to know whether their investments are engaged in viable production systems. They have vested interests in the prosperity and survival of cooperative ventures, two indications of the short and long term worthwhileness of their investments. The standing of aquaculture is a function of the groups' ability to self-sustain through efficient organizational practices and procedures. Besides, fish culture not only affects agents in charge of its promotion, but, it also affects the lives of hundreds of fish farmers and potential fish buyers. Any effort to better understand fish production conditions appears to be useful, especially when that knowledge can be used for adjustments and improvements.

The results of this study and the recommendations that are developed can guide policy-makers to design desired organizational patterns for small-scale fishery projects, taking into account the needs and means of operators, reinforcing success factors, and adjusting elements found to be counter-productive for effective organization. Designing effective policies and institutions for purposive social action must be preceded by a thorough understanding of organizational processes and motives of the beneficiaries (Cernea, 1991).

Lastly, this study will enrich the literature on farming systems and agricultural development in Rwanda. It elucidates institutional linkages and Rwandans' social and economic organization for production.

1.6. Overview

On the basis that efficient internal organization could lead to greater success of fish farmer cooperatives in Rwanda, the purpose of this study is to identify structural and organizational attributes or characteristics associated with greater performance. Research procedures, statistical analysis, findings, and interpretations primarily relate to a case study of fish farm groups selected in one region of the country.

To assist the reader in better understanding the context in which fish farmer cooperatives evolve in Rwanda, the next and second chapter provides a snapshot of the political, social, and economic characteristics of the country, and some background on collective fish farming in Rwanda. In the third chapter, a theoretical model and research hypotheses are identified, based on patterns of exchange and organizational perspectives found in the literature on cooperatives. The fourth chapter deals with the methodological considerations and procedures. The fifth chapter includes an outline of the results of the statistical analysis. Conclusions and recommendations are made in the sixth and final chapter.

Chapter 2

BACKGROUND INFORMATION ON COLLECTIVE FISH FARMING IN RWANDA

This chapter is divided into eight sections. The first section traces the political development of Rwanda, focusing on its ethnic composition. The second section discusses population pressure and its impact on land and agriculture. In section three, education is presented in relation to levels and sources of income. In the fourth section, the Project of Fish Culture in Rwanda is described, including the overall process involved in diffusing fish farming innovations to farmers. The fifth section includes a view of the main technical operations of fish farming. The sixth section traces the place of fish farming in the rural economy. And the seventh and final section outlines the administrative organization of the commune which is the main administrative unit that supervises the functioning of fish farm cooperatives.

The main objective here is to highlight the country's developmental, economic, technical, political, and institutional context in which fish farm cooperatives operate. Such a background appears instrumental in the understanding of organizational patterns and requirements of fish farm groups in Rwanda.

2.1. Ethnic Composition and Political Development

The population of Rwanda is composed of 3 ethnic groups, the Hutus (89.8%), the Tutsis (9.8%), and the Twas (.4%), according to the 1978 national census (Bureau National de Recensement, 1984). They all speak Kinyarwanda, the indigenous language. French was exported by the Belgian colonial administration at the beginning of the century, and it is used in schools, public administration, and in communication with french-speaking internationals. Historical accounts (Louis, 1963; Kagame, 1954) indicate that the Twas, believed to have been hunters and gatherers, may have been the first to inhabit the country. Then, the Hutus came, looking for land to farm and settle. The Tutsis arrived third, in search of pasture land for their cattle. The saying that the last are better served applied well in Rwanda. In effect, the Twas came first, but they were ruled by the Hutus who arrived later. The Tutsis arrived third, and they also succeeded in subduing both the Twas and the Hutus whom they feudally ruled for centuries as monarchs. Throughout the history of Rwanda, not only the Twas suffered their numeric minority, but also, they have been marginalized in the economic and political life of the country. Accordingly, if Rwanda's political development has been closely tied to its ethnic composition, it has

basically been marked by clashes between the two major ethnic groups, the Tutsis and the Hutus.

The Tutsi hegemony, which lasted for about 5 centuries during the pre-colonial times, had its basis in the control they had over land and cattle, two most valuable sources of economic wealth and power (Reyntjens, 1985:22). From 1900 through 1962, two colonial administrations, first the German, from 1900 to 1916, and then the Belgian, from 1916 until 1962, by fact and/or by law exercised supreme power over the country. Preferring an indirect rule, they maintained the Tutsi power intact, as they leaned on the King and monarchial structures to control the country. When independence came, it coincided with the 1959 Hutu bloody insurrection that led to the repudiation of the Tutsi monarchy and the takeover by the Hutu majority. A republic was announced. But, thousands of Tutsis were left refugees in neighboring countries.

Independence was granted on July 1, 1962. Since then, several successive governments have been dominated by the Hutu. In 1973 a military coup d'etat succeeded in overthrowing the then president to install the current one. Throughout the 1960's Rwandan refugees unsuccessfully launched armed invasions from their lodging countries, attempting to regain power (Reyntgens, 1985). In the 1970' and 1980's Rwanda experienced a period of relative

stability, following political arrangements designed to unite all ethnic groups under the umbrella of one political party. The recent armed attack by Rwandan refugees from Uganda seems to indicate that the years of relative calm were only a temporary break from a latent ethnic tension, which had remained under surface. Indeed, many saw in the attack nothing but a resumption of power struggles between the two major ethnic groups in Rwanda.

It is frequently difficult for an outsider to determine Rwandans' ethnic background without asking, as there is no unambiguous physical traits to base the judgement on. In fact, it is often necessary to conduct a genealogical inquiry to know someone's real ethnic identity. The mention of ethnic origin in identity cards was introduced by the Belgian administration during colonial times, and has been practiced since then. Looking in people's identity cards remains, for many, the only more accurate way to determine their identity origin. Yet, ethnic identity can be a major factor in social relations. It engraves a special character on how people from different ethnic backgrounds react to each other in their daily encounters or collective ventures.

2.2. Population, Land, and Agriculture

With the size of 26,338 km² (about the size of the State of New Hampshire which has an area of 24,032 km² or

9,279 mi² that has to accommodate a population of almost 7 millions (World Bank, 1991), and subsequently, with a population density of about 251 people on 1 km², Rwanda has one of the highest if not the highest population density in Africa. With an average annual population growth rate of 4.1 for the period 1989-2000, the World Bank (1991) estimates that the Rwandan population will grow to 11 millions in the year 2000. Its age structure shows a youth-predominated population with 48.3% of its total population being under 15 years of age (World Bank, 1991).

The high population growth imposes even a more severe burden on arable land (Blarel, 1988; Clay, 1992). The average population density on cultivable land is estimated at more than 300 people per 1 km² (Moel and Molnar, 1992). The main unit of agricultural production remains the small family farm. An average farm is estimated to be about 1 hectare in size which must feed an average family of 5 people (Randolph and Sanders, 1988). To accommodate such a large population in food supply land has intensively been cultivated and marginal land has increasingly been used (Moel and Molnar, 1992). Indeed, in the absence of intensive, more efficient agricultural techniques such as the use of chemical fertilizers, high-density intercropping has become a common feature in the peasant farming, but also, both the amount of land under fallow and the fallow

period have tremendously been reduced. Cultivation remains a physically requiring duty mainly because of the simplicity of basic equipment used. Farmers manually use hoes to till, and machetes to clear shrubs. In an effort to obtain the maximum output possible from small family lands, high-yield varieties are promoted by agricultural research institutions such as the National Institute of Agricultural Research (ISAR) and the "Service des Semences Sélectionnées." Farmers are encouraged to use organic matters such as manure for fertilizers. In order to reduce crop yield's declines owing to erosion, a massive campaign has been organized to promote anti-erosion practices, including terracing and anti-erosion grasses.

The topography of Rwanda features over 50% of the land within highlands where a large majority of the population live and produce food for their consumption (Lewis and Berry, 1988). However, because of population pressures, those highlands are under heavy stress. Valley-bottom lands are the only source of additional land for farming, given a virtual absence of uncultivated highland. In response to the high demand for land, the government allocates the valley-bottom lands, priority given to those engaged in collective operations, at least, as an intermediate solution to competition over short land (Molnar and

Rubagumya, 1988). Agricultural operations prevail among all activities done in valley lands.

Agriculture by far dominates the Rwandan economy as it accounts for over 70% of the gross domestic production and more than three fourth of the country's export earnings (World Bank, 1991). The rural economy is overwhelmingly agricultural, involving about 90% of the population living in rural areas and engaged in farm-related activities.

The principal staples include peas, beans, maize, sweet potatoes, white potatoes, cassava, bananas, sorghum, colocases, and vegetables such as cabbage. Export crops include coffee and tea in some high altitude areas. Principally oriented towards the household's self-subsistence and self-sufficiency, family farming enjoys a great deal of relative independence and product generalization as every household generally produces each of the food crops above mentioned. A small amount of the agricultural produce is held for cash sale, establishing farming as the principal source of money income for the Rwandan peasant. The two rainy seasons which alternate with two dry seasons, coupled with mild temperatures, allow 2 harvests a year for several crops such as beans, sweet potatoes, white potatoes. Most farmers raise livestock, including cattle, goats, sheep and poultry, but at an

extremely reduced scale because of a great pasture land shortage. The village usually has one or several rural open markets which serve as exchange and redistribution centers. Here farmers can sell agricultural products, and may buy foodstuffs or other domestic items they need.

Farming remains a family affair generally presided over by the household head, the husband in most cases. However, it is not uncommon to find women governing over family farming matters when, for example, upon the death of their spouses, they become household heads, having to deal with, and take over all family decisions in the place of their deceased husbands. Randolph and Sanders (1988) estimate at between 15 and 25% of all households in Rwanda are headed by women. The family uses its own labor as all members (husband, wife, and children) get involved in tilling, planting, weeding, harvesting, and post-harvest work.

Rwandan farmers do not live in planned compound villages, like in many countries. Rather, they have scattered homesteads where homes are dispersed amid their own agricultural land. A typical farm features the home surrounded by fields for bananas and other crops (Moel and Molnar, 1992).

Though the purchase and rental of plots of land are common, succession and inheritance are the principal ways

to acquire land. An adult son must receive a piece of land from his father, its location and size being left to the father's discretion. High pressures and land inheritance rights have resulted in a remarkable land fragmentation, reducing the size of a family farm, as previously mentioned. In an effort to reduce the number of landless people, the government has imposed restrictions on land purchase. Indeed, nobody can buy a piece of land from someone else without the full consent of the latter's family members. Likewise, in many cases, wives and children have opposed the sale of family land by the husband.

2.3. Education, Productive Activities, and Income

Despite enormous efforts to increase the level of literacy, Rwanda continues to have serious problems educating all its people. The World Bank's (1991) estimates show that among all school-age children only 64% and 6% were enrolled in primary and secondary (high school) respectively in 1989. Among all primary-school graduates, only 2% are accepted in high-schools, leaving many unable to enhance their education at higher levels. It is estimated that the average rate of adult illiteracy in 1985 was 53.4%, 38.8% for males and 67.3% for females (Reyntjens, 1988).

With inadequate rural development in the industrial and services sectors of the economy, a large number of young men

and young women find themselves with no other option but to rely on farming as a way of life. Indeed, most Rwandan peasants get their household income from the sale of agricultural products (Csete, 1989).

Furthermore, with the prevalence of small, fragmented family farms which require less labor, several of the rural residents are unemployed or underemployed as they all cannot be absorbed by farming (Goliber, 1985:20). In effect, only a few have the skills and economic incentives to do income-paying non-farm activities, such as masonry, woodwork, brick-making, and so on. The importance of these activities in the national and/or peasant economy is not yet fully explored. These observations imply that the Rwandan farmer in general, and the fish farmer in particular, has a low level of education and income, and in most cases, may be underemployed.

2.4. The Rwanda Fish Culture Project (RFCP)

Fish farm cooperatives are a perfect example of social organization as described by Kuhn and Beam (1982:199-201). Kuhn and Beam observe that a sponsor, staff, and recipients are the principal direct or indirect participants in the project. The Rwanda Fish Culture Project was initiated as a joint effort involving both the Rwandan government and the USAID-Mission at Kigali who are responsible for the provision of basic inputs (ICA, 1989). The Rwandan government provides

lands where ponds are constructed. Land is allocated through local authorities, including the "Bourgoumestre de Commune" (Communal Mayor), and the Sector Council (Molnar and Rubagumya, 1988). This decision-making body is assisted by the "Encadreurs des Cooperatives" (Cooperatives Organizers) who technically are responsible for arranging all the issues and problems related to cooperative associations in the communes. The level of activation of the cooperative organizer influences a great deal the level of the cooperative farm activity. The USAID-Mission provides initial machinery used to build ponds, initial fingerlings, organic products used to enrich water, nets, and so on. It also contributes in financing the training of the extensionists (ICA, 1989).

The staff role is basically held by the project staff and the extensionists. Higher level officials have two main responsibilities, which include providing sufficient training and technical skills to the extensionists, and supervising the work of the latter. They also conduct fish culture related research and are responsible for the maintenance of hatcheries that supply seed stock to farmers. The staff consists of highly trained personnel with at least a master's degree in agriculture or fish culture (RFCP, 1989; 1990; 1991).

Extensionists are the ones engaged in direct contacts with farmers. The selection of future extension agents is followed by an intensive training in fish culture at the project headquarters for at least 8 months (ICA, 1989). Once they have acquired sufficient technical skills and expertise in fish culture, they go back to their villages to diffuse the innovation to farmers. The "Training and Visit" extension system prevails. The extension agent visits farmers in their villages and gives basic instruction and supervision of fish culture on a regular basis (Benor and Baxter, 1984).

The recipients of the project are of course subsistence farmers who are its intended beneficiaries (ICA, 1989). Joining is voluntary. Farmers are attracted by the benefits they get from a new productive activity available to them, in terms of food and income security.

Since its creation in 1983, the RFCP has made substantial accomplishments in 9 of Rwanda's 11 districts. In 1990, it had a total of 23,909 registered fish farmers from 6,067 rural families, operating 2,879 ponds under the technical supervision of extensionists trained at the project headquarters (RFCP, 1991). Of those 2,879 ponds, 1,950, hence, 67%, were collectively owned.

2.5. Technical Description of Fish Farming

Growing fish in artificial ponds involves a complex process including meticulously done operations in digging

ponds, maintaining proper and adequate water supply in ponds, fertilizing the pond, feeding the fish, and harvesting. Farmers do some of these operations themselves. However, other operations require complicated technical details which necessitate the expertise and close supervision of the extension agent. Information to be conveyed here about fish pond operations was principally drawn from several sources, including FAO (1974); Maar et al. (1966); Martel and Narakas (1984) and the RFCP reports.

Ponds are excavations in rectangular form dug in flat valley lands. They are constructed in such a way that their walls, which retain water, are sloped (Maar et al. 1966; FAO, 1974). The size of the compound is primarily dictated by the quantity of the fertilizers and feeds available to the farmer, and the size of the harvest desired. It is estimated that a 20 x 25 yards pond should be the smallest unit for a subsistence fish farm, while a commercial farm should not be smaller than 1/10 of an acre (FAO, 1974). Swampy and sandy grounds, and laterites are preferred soils for pond construction mainly because of their water retention properties (FAO, 1974).

Water management in the pond is done through a system of canalization with an inlet to let water into the pond, and an outlet to drain water from the pond during harvesting. A reliable and permanent water supply is necessary to replace

water lost to evaporation and seepage. Water supply is done through a furrow laid out from a nearby stream or spring to the pond. To avoid overflow of water, farmers use grass-laid mat, stones, or any sort of cover to stop water at the inlet when the necessary level of water is reached. The inlet is open whenever the level of water in the pond becomes lower than it should be. Underneath the bottom wall of the pond a pipe is laid out to let water out when harvesting through pond drainage.

The species of fish currently being promoted by the RFCP is the *tilapia nilotica*, a highly prolific fish (FAO, 1974). Besides, the tilapia can thrive on a largely vegetarian diet, which is available locally (Martel and Narakas, 1984; INADES, 1979). Farmers feed the fish with grass clippings and plant leaves, including cassava, sweet potato, maize, colocases, cabbage, and so forth. Tilapia also eat waste products such as banana beer waste, sorghum beer waste, peelings of banana and potato, and so forth. Farmers usually collect the feed from their homes.

Here cooperatives can offer a particular advantage over individual holdings. Members divide labor and all responsibilities, including collecting the food for fish. Given the conditions of resource scarcity that peasant households face, and when the feed originates from several sources, the collective responsibility of feed gathering

represents a more certain guarantee that fish will be fed on a regular basis than if the feed was coming from one household.

Furthermore, tilapia, especially younger ones, rely on vegetal and animal plankton naturally produced in ponds. Planktons are microscopical-size organisms which live on food naturally produced when organic matters decompose in water (FAO, 1974). To produce that natural feed which facilitates the growth of plankton, and thus, creates conditions for increasing fish production, ponds are regularly fertilized with organic fertilizers, including manure of cow, pig, goat, and poultry. Farmers get the manure from their homes when they raise livestock. Manure is also gathered from nearby slaughter facilities. Manure for pond fertilization is placed in a compost created in the pond. Farmers build in water at the margin of the pond a relatively small enclosure with small sticks. An adequate level of manure in the compost is maintained on a regular basis, while the compost is daily turned over to facilitate organic decomposition and allow dispersion of plankton food through the pond. Because of their prolific nature, tilapia can soon outbreed their food supply if the latter is not constantly checked. Farmers are advised to feed daily with progressively increasing quantities of the feed as fish grow and multiply. As part of the feeding system, pond fertilization is very important in

fish culture as the more fertile is the water, the more plankton is available, and the more tilapia can be grown (Projet Pisciculture Nationale, 1983).

Tilapia is often preferred and promoted because of their reproductive capacity, which may guarantee high yields in relatively short times. However, as a highly prolific species, tilapia causes serious problems to its own growth, to fish culture, and to agriculture in general. Indeed, high reproduction rates of fish constrain the carrying capacity of the pond. They induce high fish population densities. Overpopulation increases competition for food and territory in the pond, among the fishes themselves on one side, and between tilapia and other animal species on the other side. Subsequently, it induces, on one side, the proliferation of very small fishes, and on the other side, it leads to aggressive behavior at the expense of small fishes which are attacked by bigger ones (Balarin and Haller, 1982). Small sizes of fish can undermine its tastefulness and commercial value. Furthermore, tilapia poses as a genuine competitor for food and fertilizers to both domestic animals and agricultural plants. This situation can unbalance the ecosystem, by undermining marine life in ponds in particular, and agricultural development in general.

Three methods can be used to control population densities in ponds. First, optimum stocking rates are

determined. The rate of 1 fingerling per 1 m² of the pond is usually recommended (Martel and Narakas, 1984). This method allows the sowing of a determined number of fishes which can optimally be supported by the pond during a certain period. The second method involves the practice of a monosex culture whereby only all-male fish populations are raised (Balarin, 1979). Male fingerlings can be manually separated from their female counterparts. Female and male genital papilla can be distinguished as fish grow. Also, male fingerlings grow almost twice as quickly as the females (Balarin and Haller, 1982). This method presents setbacks as some females may glide in. More reliable ways of producing all-male fishes are more sophisticated. They involve crossing all-male hybrids of certain types of tilapia, or reversing the sex of young fishes through hormonal treatments produced chemically and mixed with the feed (Balarin and Haller, 1982). The third method of tilapia reproduction control consists of practicing polyculture whereby less prolific, slowly growing, bigger fishes are raised in the same pond, to serve as predators to tilapia (Islandari, 1986). The bigger species of fish will eat baby tilapias, leaving the big ones alone.

It is after 6 months that farmers do the harvesting as it takes that time for the initial fingerlings stocked to reach maturity. Two methods are used to harvest. For a large harvest pond draining is used. Once all water is drained all

the fish in the pond is taken out. The mature ones are either sold for cash or taken home for family consumption. The younger ones are sold to other farmers or set aside for restocking. For a partial harvest a net is used. Nets belong to the project but they are kept in villages by the extension agent who gives it to the farmers whenever needed.

Farmers have at least three ways they distribute the profits among themselves. The first is to equally distribute the total fish harvest. Each member is then free to do whatever he (she) wants with his (her) share by either taking it home for family consumption, selling the fish, or taking home one part of the share and selling the other part. In the second case, the whole fish harvest is sold and members may either distribute the cash obtained from sales among themselves, or they may save it in a common bank account. Thirdly, members may decide to sell one part of the harvest, distribute or save the cash, while they distribute the other part, each member taking home his (her) share.

Because of the extremely perishable nature of fish, it has to be marketed as soon as it gets out of the pond. One 1989 study found that tilapia marketing did not encounter any major problem because the quantity of fish put on the market was very limited, there was no need for intermediary middlemen, and the sale of fish directly took place on the

pond bank by neighbors told about the fish harvest the previous day (Molnar et al, 1990).

Farmers have book records in which they keep basic information on pond dimensions, date of stocking and number of stocked fingerlings, amount of money paid for securing the fingerlings stock if necessary, date of harvest, number of fingerlings and mature fish sold, amount of sale cash if any, and so forth. The commercial price of tilapia greatly varies between 100 and 150 Rwandan francs (\$1.00 and \$1.50) per fish, depending upon the size of the fish.

Farmers are encouraged to erect fences and cut any grass around the pond as a way to prevent birds, wild fish, snakes, and other predators from damaging the fish in the pond. They also have to closely watch over the pond to prevent any theft or vandalism of the pond.

Farmers grow vegetables especially cabbages and colocases around the pond. The vegetables are used to feed the fish in the pond. In their turn, the vegetables are watered through the outlet from the pond. This represents a fish-vegetables self-sustaining system.

Integrated fish-animal production systems are practiced at the RFCP headquarters, but at an experimental stage. Cages are erected on top of fish ponds, where pigs, sheep, poultry, ducks, and rabbits are separately confined and regularly fed. Dropping and manure of those animals are directly released

into the ponds. The RCFP envisage to diffuse these systems into the rural communities, in the near future. Then, these systems will be an easier way to simultaneously fertilize ponds, increase fish production, and raise livestock and poultry. The adoption of those systems by the farmers will depend upon their relative small scale and their adaptability to local environments.

From the above presentation, it appears that the implementation of fish culture in Rwanda involves a complex system consisting of training, learning, and organizing. Not only do farmers learn general principles of raising tilapia, and practices of routine pond management, they also make labor organizations and arrangements to construct the pond, fill it with water, stock, keep water fertilized, feed fish, watch the level of water in the pond, crop the fish, and market it. Those operations have a relatively high labor investment. When farmers operate as a group, good and intensive labor management is necessary for the farmers to have a successful culture and high yields of fish.

In sum, there are numerous merits of fish farming for the Rwandan peasant. In effect, compared to other forms of livestock raising, it requires less and locally available inputs; it puts to productive use marginal lands, such as valley-lands, which, otherwise, may be considered worthless. Tilapia technology is relatively less expensive, less

complex, and less labor-intensive. Above all, its small scale makes it fit with the productive capacities of the Rwandan small farmer (ICA, 1989).

2.6. The Place of Fish Farming in the Rural Economy

The widespread acceptability of fish culture and the desire expressed by pond operators to expand the activity by building new ponds imply a high value of benefits associated with aquaculture (Molnar et al., 1990). To the extent that farmers produce fish for local consumption, tilapia production can be referred as subsistence fish farming. Farmers find satisfaction in fish as an addition to their families' food reserve and diet quality and variety. The extent of fish consumption and its nutritional status among the targeted rural populations remain to be extensively investigated because fish farming is a relatively new practice, and the degree to which fish preservation methods locally available is not fully explored.

Nevertheless, the characterization of tilapia as a subsistence commodity should not obscure the fact that farmers trade fish for cash. In fact, even though production does not yield high surpluses of fish, there is a substantial local market for the quantity held for sale. Tilapia represents the largest source of financial gain for many fish farm operators (Molnar et al., 1990; Peterson, 1982). An

account of the economic profitability of fish farm operations remains to be systematically explored. Such an undertaking would reveal the economic payoff of fish farming taking into account the costs and benefits. However, Molnar et al. (1988) indicate the economic returns would be difficult to interpret for at least three reasons. First, it is tedious to interpret shadow fish prices when those prices in many cases depend on visual estimation of the size of fish. Second, the undertaking requires making estimations and assumptions about the amount of labor/input, fertilizer and feed input in ponds, as no direct account of the exact amount is recorded at the time of their occurrences. And thirdly, it is very difficult to assess the monetary value of fish taken home for domestic use.

Fish culture is essentially a part-time farming enterprise designed to supplement the farmer's income as well as enhance the household food security. Once the preliminary operations of pond construction, stocking and watering are finished, the remaining routine pond management activities take little time. Along with fish culture, farmers can have time to grow food stuff and cash crops and raise livestock which constitute the major components on the Rwandan peasant farming system.

2.7. The Administrative Organization of the Commune

Rwanda is divided into 10 prefectures which are larger administrative units, and Kigali City, the capital newly made a district entity by itself. Each prefecture is organized into several communes. The government policy is to make a commune the principal planning and administrative unit for local development activities. The top Administrative Officer of the commune is the "Bourgouestre" or Communal Mayor who is appointed and dismissed by the President of the Republic. The Bourgouestre is assisted by a Communal Council made up of representatives elected by popular vote from the sectors. A sector is subdivided into cellars that also have elected officials.

The Bourgouestre and the Communal Council have the authority to establish security and development policies in their communes. It is that decision-making body that allocates to farmers lands where fish ponds are constructed. Prefectures and communes are under the Ministry of Interior and Communal Development.

Each commune has an "Encadreur des Cooperatives" or cooperative organizer whose role is to advise the Bourgouestre and arrange all the issues and problems related to cooperative associations in the commune. The cooperative organizer is involved in the official recognition of the groups. He (she) is the one who popularizes the cooperative

as a framework for productive and economic activities, and assists in the formation of fish farm groups. He (she) is the primary arbitrator whom group members talk to whenever conflicts and disputes arise. He (she) is responsible for educating farmers about cooperative values, modes of operation, their expectations, right, and obligations as group members. The cooperative organizer is an employee of the Ministry of Youth and Cooperative Movement, based in the commune. His level of activation influences a great deal the level of cooperative farm activities as he (she) is to be closely involved in the dynamic process of cooperative functioning.

Throughout its independence years, Rwanda has known a one-party political system, whereby the party guided all aspects of social, economic, cultural, and political life of the nation. In October 1990 a war broke up, its instigators protesting among other things the lack of a multi-party, democratic regime. Claims of a new political thinking were preceded by and echoed in the wave of Eastern Block countries' political changes which reached many nations until then not democratized. The new political order reached Rwanda where, already as of June 1992, 15 different political parties were officially recognized and were active

in their competitive search for partisans/followers. Many more may emerge in the future.

The outcome of those events is not yet known, but in its infancy when rules of political tolerance are not yet understood by everybody, the multi-party regime may alter the current social relations and organization of Rwandans in general, and rural farmers in particular. Indeed, the harmonious coexistence that Rwandans have enjoyed for some time may be disrupted by divisive partisan platforms carved along ethnic or regional lines. Divergence of political views may be interpreted as antagonism or manifestations of hostility towards oneself, enticing more enmity among people. Furthermore, it was observed that a central element in local administration is the Communal Bourgoumestre who acts as the catalyst for social and economic development. Thus far, political authorities, including the Bourgoumestre, have been appointed by the President of the Republic. In the future, multi-party elections will be the procedure for choosing officials. The passage to electing officials implies new forms of lobbying, new forms of alliances, which may alter the existing structural relationships between the governing authorities and the governed masses on one side, and among the masses themselves on the other side.

Chapter 3

REVIEW OF RELATED LITERATURE AND THEORETICAL ORIENTATION

Any organized action presumes the bearing of individual incentives to join and sustain the physical and moral commitment of participants. Also, it necessitates a system of coordination of disparate components into one coherent unit. An apprehension of the nature and processes of collective action is a first step for understanding dynamic elements in fish farmer cooperatives.

The objective of this chapter is to provide theoretical and empirical grounds for the why and how of agricultural cooperatives, and identify a testable model and hypotheses that will give orientation to this study's design and analysis. The chapter is divided into two sections. In the first section, social exchange and organizational perspectives will be highlighted in order to account for organizational processes, applied to cooperative associations. In addition, in the same section empirical evidence to substantiate the relevance of factors of cooperative organizational dynamics will be investigated from the literature. In the second section, a model for fish farmer cooperatives' structural organization and research hypotheses are suggested, based on factors identified to be the most significant in cooperative dynamics.

3.1. Processes of Agricultural Production Cooperative Organizations

Two steps are involved in explaining the forces and processes of agricultural production cooperatives. First, exchange theory is used to highlight a theoretical account of the perspective and conditions under which individuals engage in cooperatively organized activities. Secondly, the study draws from elements of organizational theory to account for organizational dynamics and processes, applied to production cooperatives.

3.1.1. Exchange in Social Relations

The theory of exchange in social life was developed and defined by several authors, including Blau (1974), Cook (1987), Heckathorn (1985), Homans (1974,1990), Willer (1985), and others. Its principal proposition is that exchange considerations underlie human behavior and relations. Any human relation is seen like a contract between parties engaged in the relationship. The patterns of mutual contractual obligations are defined in terms of expected costs and rewards. Because exchange theory views humans as fundamentally rational, it suggests that humans avoid costly behavior, choosing, instead, to engage in rewarding and profit-maximizing relationships. Rewards are the payoffs or material outcomes that one gets from a relationship. Rewards have tangible sources such as money

and material payoffs, as well as states of mind such as autonomy, security, social approval, and opinion agreements. Costs are referred as foregone material rewards as well as disliked things resulting from persecution, distrust, social disapproval, and repugnance, such as relationships involving rejection, powerlessness, and so forth. Costs can also be foregone relations when competing alternatives are chosen. Exchange items are valued both in terms of the material worth and social and symbolic value associated with them. The theory is meant to imply that only a profitable relationship in which rewards exceed the costs, is sought. When the opposite occurs and the costs exceed the rewards, the individual will choose not to engage in the relationship.

Because exchange in social relations takes place through the reciprocation of rewards and costs between interacting parts, before individuals engage in any relationship, a choice is consciously made between competing alternatives, and they will select the alternative from which they anticipate the greatest rewards and fewest costs, both in short and long-range terms. Individuals are perceived as highly calculating and rational actors who make choices producing socially and economically profitable outcomes, efficiency being the principal criterion for selection.

Social exchange theory has been extensively referred to as a useful theoretical framework to explain the conditions and processes of organized action in studies on the family, voluntary organizations, small groups, and formal and complex organizations. Also, exchange theory has been used to explain cooperative behavior in dyad to relate social exchange in interactions between two individuals (Rabbie, 1991). It has been used to account for cooperative motives in what has been referred to as "the prisoner dilemma" (Yamagishi, 1985). Also, it can provide a useful perspective to understand the contractual relationships in cooperative associations between the individual and the group.

Collective farming serves as a practical means to achieve self-interests. For Bennett (1983), cooperation between members of agricultural collectives in the development process is fundamentally characterized by instrumental exchanges inasmuch as that cooperation helps to enhance shared self-interests. Indeed, the individual/member provides labor, time, and expertise, expecting, in exchange, social and economic benefits from the group's outcome. Fish farm cooperatives exist to further the interests of their members, in terms of food and income security. Contributions made to collective efforts and the dividends are seen as constituting the

costs and benefits. In line with exchange theory, each member joins a cooperative hoping to get benefits, and he (she) will continue his (her) participation in the group as long as the payoffs offered him are as great or greater than his (her) contributions in terms of his (her) values and alternatives open to him (her). This suggests that a member is likely to exit from the group when he (she) finds that a more profitable alternative is available in terms of income, food security, and social relations.

Bennett (1983) adds that the instrumental, goal-oriented exchange relations among group members set up the stage for the creation and strengthening of social bonds, evolving from patterns of exchanges among group members, togetherness, interdependence, and friendliness. In that sense, cooperation is a way to practical and economic ends, as well as a social investment.

During the process of exchange relations, one important condition must be satisfied. Rewards and costs must be reciprocated to build mutual trust and effective communication network.

Balanced Reciprocity

The notion of balanced reciprocity in exchange relations has been discussed by Willer (1985), and it is conveyed in ideas of fairness (Blau, 1964) or distributive

justice (Gouldner, 1960; Homans, 1974, 1990). It stipulates that in exchange relations each contracting party expects rewards to be proportional to incurred costs. Otherwise, any rewards-costs imbalance, which is determined on the basis of both the underlying objective and subjective value that contracting parties attach to those rewards and costs (Blau, 1964:217), can jeopardize the social system itself. Homans expressed that idea when he wrote:

"Relative deprivation or distributive injustice occurs when a person does not get the amount of reward he expected to get in comparison with the reward some other person gets. He expects to get more reward than the other when his contributions-what he gives in social exchange- and his investments -his background characteristics- rank higher than the other's, equal reward when his contributions and investments are equal to the other's, etc (Homans, 1974:268)."

Unless corrective mechanisms exist or are implemented to compensate for defects in felt unfair exchange, lack of balanced reciprocity can provoke a breakdown in the relationship, following feelings of frustration, anger, and victimization (Gouldner, 1960; Willer, 1985). Victimized actors may take the exit option to show their anger and avoid costly engagements. Or they may reduce their level of activation on the basis of their assessment of the partners' level of engagement.

In production cooperatives members exchange labor, time, expertise, and production equipment and resources in order to increase their payoffs in the form of enhanced

production and subsequent cash income obtained from the sale of their produce. Norms of reciprocity dictate that, in principle, individual benefits be proportional to individual time, labor and resource contributions. In egalitarian production cooperatives like fish farm associations in which the benefits are equally shared among members, individual contributions must be identical, or the survival of groups must rely on special valuation mechanisms whereby probable imbalances in costs are tolerated.

Distributive justice in cooperative organizations is a value which can influence the success or failure of collective enterprise. With its preservation, there is a perception and feeling that norms are respected whereby every member gets deserved returns to contributions. That perception can be an incentive for work and commitment to the group enterprise, which, in turn, positively affect the success of the cooperative. On the contrary, lack of distributive justice implies the violation of rules, and can alienate some members who feel that they are deprived of their rewards in favor of others who do not deserve it (Homans, 1974; Molnar et al., 1985; West, 1983). In fact, distributive justice reflects a proper reciprocation of rewards and costs in social exchange. In the contractual relations members have with their group, lack of distributive justice means that some members are being

reciprocated less than deserved. As a result, deprived members may reduce their participation and commitment to the group's activities.

Underlying the concept of balanced reciprocity in exchange relations is the idea of trust. For healthy exchanges, each contracting party expects and must trust the other to reciprocate rewards and costs. By continuously fulfilling their obligations, each contracting party inspires trust in connection with the commitment to cooperative exchange relations through reciprocity (Blau, 1964; Heckathorn, 1985). However, it has been pointed out that situations of "social dilemma" or "free-rider" permeate social exchanges. Because humans are viewed as fundamentally oriented toward self-interests, some contractors may behave uncooperatively, when rationalized self-interests are better served by non-cooperative behaviors. That phenomenon happens in public goods where the consumption of a good or service is not determined by how much an individual contributes toward the production of that good or service. An example of public goods is a public recreation park (Olson, 1965).

Ironically, cooperation can have the same features of a public good. An individual can reduce his costs by decreasing the level of activity concurred to produce the good or service, and still get as much satisfaction as

those whose level of activity was higher (Olson 1965: Yamagishi, 1985). When this occurs, it challenges norms of reciprocity on which exchange relations are founded, because there is imbalance in exchange of costs and rewards.

To overcome social dilemma and restore balanced reciprocity and trust, a selective incentives system can be implemented whereby the benefits are determined on the basis of the amount of individual contributions (Cook, 1987; Yamagishi, 1985). Trust can also be sustained through enhanced feedback and communication flows in which contracting parties check each other's performance (Conlon and Barr, 1989). Not only such feedback facilitates the assessment of every one's willingness to cooperate, but it also reduces the perceived risk to engage in exchange interactions (Rabbie, 1991).

3.1.2. Organizational Structure

Any productive institution can be described through the level to which it structurally enacts and enforces rules, and activates resources in order to achieve some determined common goals. The structure of organization in social organizations aims at channelling or directing the behavior of participants for the purpose of achieving organizational goals. It involves planning, organizing the work, designing

the decision-making process, implementing, and carrying out administrative routines.

Control in Organizations

A major basis of organization is to maintain legitimate social control through a set of implicit or explicit rules designed to direct or control behavior of participants (Janowitz, 1975; Perrow, 1986). Rules define roles and settle boundaries for task assignments; they regulate activities by defining the rights and responsibilities of every member in the organization; they determine sources, prerogatives, and scope of authority and leadership; and above all, they prevent any ambiguity in the implementation of plans (Perrow, 1986). For rules to be effective and efficiently implemented, they must be known, understood, and capable of being reinforced.

Both formal and coercive and informal processes sustain social control in organizations. On one side, organizations rely on selective recruitment strategies to insure that only those who satisfy certain characteristics can become their members (Hall, 1987). Organizations also activate their systems of rewards to enforce order, high work discipline, and commitment to organizational goals (Barley, 1988; Hall, 1987). Salaries and fringe benefits that organizations pay employees encourage employees to devote more efforts to the

organization activities. Moreover, departmentalization of participants' power through the stratification of prerogative authority and through professional specialization of tasks establish patterns of downward control which is exercised by different higher levels of authority to monitor the performance of subordinates (Barley, 1988; Hall, 1987). On the other side, informal internal organizational control mechanisms are created through a network of social and friendship ties that evolve in organizations.

Leadership and Power in Organizations

Leadership serves as the link between the organization and task demands. It practically coordinates the collective effort. It holds the official and instrumental role of monitoring compliance with organizational rules, influencing and directing activities, and disposing of resources to achieve certain goals (Graumann, 1986). It coincides with top decision-making activities. In order to accomplish its role, leadership is equipped with power: the ability to influence organization's members and make them perform organizational tasks (Homans, 1974; Perrow, 1986; Weber, 1947).

Leadership power is a two-dimensional process stemming from its sources. On one side, organizations have members entitled with the responsibility to make decisions and

influence the course of actions. As such, the leadership process bears the notion of official authority, or legitimized power (Blau, 1964). That power is coercive since it is exercised through the threat of sanctions. On the other side, organizations may have members with no official positions, but who have the potential capacity to influence events and activities (Cartwright and Zander, 1959; Graumann, 1986; Perrow, 1986). That informal power has sources that range from personal charismatic and persuasive qualities through monopoly over specific expertise and knowledge necessary to perform organizational tasks.

The exercise of power in organizations is inevitably unequal since some command and control power sources more than others; some receive orders from others. The leadership has the power to distribute organizational benefits to other members of the organization.

The relevance of organizational structure to collective action in fish farm cooperatives becomes apparent when one inquires about their structural characteristics. These include rules that structure and regulate collective activities, establish levels, ways, and conditions in which cooperation is to occur, and determine every member's scope of authority, rights, and duties. Structural characteristics also include the extent of participation in the decision-making process, communication patterns, features of the

division of labor, centralization or decentralization of operations, activation of the reward system, and so forth.

Self-management and the principle of collective decision-making in fish production cooperatives defies conventional organizational norms. It calls for collective and equal control and power. All members must agree on patterns of formal and informal control mechanisms. Equal power presupposes equal access to power sources. Members must implicitly or explicitly approve arrangements made about the division of labor, the disbursement of contributions, and the distribution of benefits.

Fish farm groups' representatives are authorized to initiate and guide ideas and goal attainment, while ushering in goal achievement and activities in the group. Their leadership and its relation to group organization is crucial in affecting organizational outcomes. However, their authority patterns are different from those encountered in bureaucratic organizations. In effect, fish farms have a simple authority and hierarchy structure, a relative absence of internal interest groups differentiated on the basis of incompatible goals and means, and a shared ownership and control of the means of production. In line with those characteristics of production cooperatives, there is rather a self-management type of structure whereby the leader's role

is to induce involvement and motivation of peers/group members in a joint effort, while creating a work environment and relationships conducive to group cohesiveness.

As a group of peers, a cooperative is regarded as a democratic organization espousing egalitarian principles. Influence and power differentials are not legitimated as they imply elitism and the usurpation of decision-making not by the group as a whole, but by individual members. Any structural source of power differentials in the organization ruins democratic conditions on which cooperatives are founded. It can lead to a situation of internal conflicts originating in the unequal access to power and influence. Conflicts can lead to lack of cooperation, undermining prosperity and survival of the relative performance of agricultural production cooperatives.

Rewards in Organizations

The role of incentives and rewards in social organizations is crucial to motivate members to join an organization and devote themselves to organizational goals. In bureaucracies remunerative incentives and different kinds of advantages are used to motivate work and build commitment to the organization (Blau, 1974; Scott, 1987). In formal organizations rewards are determined on the basis of various factors, including: 1) economic, social and political

considerations; 2) size and importance of the organization; 3) the bargaining power of members; and 4) the perceived contributions that each member makes toward producing the organizational outcome (Perrow, 1986; Scott, 1987).

However, rewards are also an institutionalized organizational tool to control members. Important in organizational dynamics is the differential treatment and distribution of rewards. Rewards for performance accorded to members of an organization who demonstrate acts of high merits, promotions based on seniority, experience, and perceived competence, differential wage systems based on ranks in the hierarchy, and so forth, all are parts of the incentives system designed to ensure continued affiliation and commitment to the organization.

In cooperative organizations such differential rewards are not accepted, at least in theory. In fact, preferential treatments are illegitimate, given the egalitarian cooperative doctrine. In fish farm cooperatives egalitarian principles are reinforced by collective property rights on pond lands, and by the implicit understanding that equal contributions are to be made by members.

Communication in Organizations

Communication patterns and networks are important in organizations because they define linkages and interaction terms between those organizational elements. Those elements

include the leadership, the subordinates and their power and professional interactions; institutionalized rules, policies, procedures; patterns of vertical and horizontal coordination between different professional units and sub-units; informal collective values, beliefs, and expectations; interactions between different participants (Hall, 1987). It is through communication channels that they are connected with each other. As such, communication is a tool of managerial decision-making as well as an instrument of organizational control and coordination, and a tool for social and professional maintenance in organizations.

Communication channels are used for feedbacks, exchange of information, clarifications about task demands procedures, and policies. Vertical communication channels are used by superiors to address subordinates to give instructions about rules, practices, behavior, policies, and evaluate their performance (Hall, 1987; Redding, 1985). They are also used by subordinates to convey claims and requests of clarification, feedbacks, and adjustments from their superiors. Sustained interactions serve to maintain organizational identity and group solidarity among peers (Hall, 1987). By giving organizational participants a voice in running organizational tasks, communication empowers and motivates members toward organizational goals. Communication can take several forms, including meetings, memos, mails,

personal interactions between members, training sessions, and so on. However, Hall (1987) and Pfeffer (1981) pointed out that access to communication channels and information are useful tools to acquire power, influence, and control in organizations. According to Hall and Pfeffer, information can be used to reduce uncertainty to acquire power. An example can be found in the nature of vertical communication and associated hierarchical stratification. Because members' positions determine the amount of information they have access to, those in higher positions command a substantial power base they can use to enhance self-interests.

Communication is an ongoing self-actualization process in an organization as a mechanism to assess, correct, and improve the organizational performance. As part of the communication and decision-making process, self-criticism functions as a way to amend failures to meet expectations or comply with organizational rules, and appreciate proper behavior, for the sake of the organization's enrichment. It can take several forms, including reprimands, public meetings in which feedbacks and self-assessments between members of the organization are exchanged, unions' claims, and so forth.

As an assessment and correcting mechanism, an institutionalized and legitimated self-reevaluation process can be useful in production cooperatives such as fish farm groups by controlling and regulating the behavior of group

members toward organizational goals. Such self-criticism can single out abuses, disclose malpractices, free riding, or any wrong doing by any member. Good communications enabling feedback are usually found to lead to unity and cohesion in groups (Pace, 1983; Sargent, 1982).

Resources Development

To ensure more reliable job performance, organizations establish instruction programs or job-training sessions on a periodic or continuing basis, designed to enhance its members' skills toward their jobs and orient their attitudes toward the organization (Katz and Khan, 1978; Hall, 1987). Managerial training is geared toward the improvement of decision-making and communication skills. Other organization participants learn conceptual and practical skills and attitudes enabling them to perform technical tasks they are asked to do. Instructions are rather specialized intended for specialized work. Thus, job training rises the level of professionalism in organizations. Professionalism is enhanced through experience and on-job training.

As such, many authors see in job training another institutionalized way of controlling the behavior of members by delineating the scope of their knowledge in the organization (Attewell, 1987; Barley, 1988; Penn, 1982).

Organization's members are seen as being "deskilled" through enhanced specialization. Their bargaining power is eroded through knowledge restriction.

At the early development of cooperatives as economic and business organizations, the pioneers saw the imperative need to further cooperative knowledge because not all members understood the meaning and value of cooperation (Roy, 1981). They envisaged cooperative education and training to be part of the ongoing process of organizational enhancement whereby members would be instructed about their rights and responsibilities to the collective enterprise. In fact, cooperative education and training involves a socialization process during which group members learn norms, rules and patterns of behavior as related to the organizational goals and objectives. Such a process is important for members to perceive and recognize the relationship between means and ends in an effort to understand the meaning and purpose of cooperative organizations. The function of cooperative education and training in cooperative associations can be paralleled to the role of workshops, seminars, training sessions, participation in conferences and professional meetings in bureaucratic organizations such as educational organizations. Not only do they familiarize members with the organization's procedures, but also they enhance members' aptitude and competence to fulfill their role in the

organization. Beal et al. (1956) pointed out that knowledge of basic cooperative principles and the understanding of facts about cooperatives are some of the main dynamic factors of members' motivation and participation.

Stinchombe (1965) suggests that the age of an organization can be a liability for its long-run performance, as older organizations are more inclined to provide members with opportunities to take part in and influence decisions than younger and still insecure organizations. With respect to the internal organization of fish farm groups, the differentiation in terms of social/demographic background of the group, defined on the basis of age/duration of collective action, can count for any variation in groups' performance.

3.2. Factors of Success and Failure in Production Cooperatives: Empirical Evidence

On the premise that effectiveness in cooperation is related to effectiveness in fish farming, this study is limited to the dynamic nature of the structural/organization of fish farmer cooperatives.

Moreover, the study assumes that external forces, in terms of technical and financial assistance fish farmer cooperatives receive from the government or donors, extension service, ecological and market conditions, cultural orientations, and the legal and financial norms imposed upon them, identically affect all fish farmer cooperatives, at least those situated

at the same region. In connection with that assumption, the inclusion of external factors in the study is not called for because they are viewed as not influencing any variation in cooperative effectiveness. That is why only internal determinants of success and failure in agricultural production cooperatives are reviewed here. The objective of the review is to identify factors empirically found to influence effectiveness of agricultural production.

Success and failure factors in literature on cooperative can be summarized under five topics: economic prosperity, membership homogeneity, democratic participation, distributive justice in sharing of costs and benefits, cooperative management and organization skills, and membership size.

Economic Prosperity

Economic prosperity of cooperatives has often been considered as an end. Likewise, it was treated as the dependent variable to be explained by individual and structural factors (Sargent, 1982; Wakeley, 1957; Warren et al., 1976). However, it can also be viewed as its own factor. Indeed, economic incentives are believed to be critical for the success of collection actions. Indeed, the possibility of agricultural production expansion and the enhancement of farmers' returns are some of the major reasons cooperatives

are established in the first place, and they remain critical to their success (Dorner, 1977; Obern, 1981). Farmers voluntarily pull together their resources hoping to take advantage of scale farming manifested in the horizontal integration. Without the enhancement of members' returns, which are highly associated with the level of production, cooperatives may not be worthwhile. Several studies have concluded that one major cause of failure of cooperatives was their failure to fulfill economies of scale and perceived advantages that make collective actions desirable (Molnar et al., 1985; Obern, 1981; Ryan, 1985; West, 1983).

The economic efficiency of cooperatives depends on several external factors, including social, economic and physical local conditions. Nevertheless, for members the realization of greater returns derived from cooperation can be an important motivation for more cooperation. Thus, cooperative economic efficiency is significant only with respect to the level of individual returns. Higher level of returns induce member to have favorable attitudes and conduct toward the collective enterprise, while lower returns are sources of non-satisfaction and eventual exit (Beal et al., 1956; West, 1983; Molnar et al., 1985).

The levels of returns are, in their turn, influenced by membership size. Molnar et al. (1985) suggest that excessive membership with respect to the carrying capacity of the

endeavor operation enables a cooperative to adequately reward its members' labor. They indicate that, in the long run, disappointments and frustrations derived from excessive membership may threaten the survival of the enterprise. In their study on fish farm operations in Panama, they suggested that a size of 7-15 members per group is relatively adequate, given the fish production capacity of the ponds they studied. In other cooperative settings, the membership size has to be determined on the basis of production conditions.

Membership Size

Divergent conclusions have been reached concerning functions of membership size in cooperative enterprises. In effect, it is suggested that limited membership enhances personal interactions and facilitates communication within groups (Molnar et al., 1985). Subsequently, limited membership size can facilitate patterns of consensus, participation, coordination of activities, and arrangements about the division of work (Molnar et al., 1985). As such, it is considered as a factor of motivation and success in production cooperatives.

However, Bergmann (1956) suggested that, when the size of a group is small, the labor force is restricted and the organization of work becomes inflexible as any case of illness, accident, or absenteeism affects the normal work and

its outcome. That idea indicates that larger groups may be more efficient than smaller ones, given the bulk of work and task demands.

Distributive Justice in Costs and Benefits Sharing

The role of equity and distributive justice in cooperatives has been emphasized in several studies, including: Hopkins (1976); Obern (1981); West (1983); and Molnar et al. (1985). The basic idea from those studies is that cooperative members are more committed to their cooperatives when they feel they are not being used and taken advantage of. This occurs when members feel the benefits are proportionate to the contributions of each one.

One major consideration with regard to the division of labor and work arrangements is the perceived administered justice in work assignments which must be counterbalanced against fairness in benefits sharing (Derman, 1978; Hyden, 1978). Because many cooperatives operate under the principle of equal benefits and equal work, they implement mechanisms to establish fairness, such as equal amount of water in irrigation schemes (Molnar et al., 1985). A pertinent problem that cooperatives face is to determine the value of individual labor contributions since members do not bring the same motivation, energy, and skills, and time to collective work (Peterson, 1982). Molnar et al. (1985)

observes that, as a mechanism to compensate for perceived inequities in Central Panama, it was normal that some cooperative fish farmers received bigger fish than others.

Membership Homogeneity

One important organizational aim in production cooperative societies is to build a cohesive group that can implement a consensual decision-making for action.

Several research findings have shown that membership homogeneity, in its broadest sense, implying the social, economic, and political similarity of members, is very significant for organizational effectiveness. Indeed, it is found that solidarity ties and some form of identity in social and economic status are necessary intermediary factors between members and their participation. Coward (1977) indicated that kinship and family ties facilitated communication and participation of cooperative members in collective irrigation operations in the Philippines. Lomintz (1977) found out that social status and education were factors of people's non-participation in social and productive activities in Mexico. Berrenan (1967) suggested that, in India, differences in social prestige and class, and a differential access to land resources, alienated the landless and low-class farmers who, in the end, chose not to participate. West (1983) came to the same conclusion in Sri

Lanka. In India as well as in Sri Lanka, the least powerful groups feared that the benefits of joining development programs may be enjoyed only by the most powerful at their expense.

Group homogeneity is important in production cooperatives because it is the basis for solidarity, group identity, trust, and orientation toward cooperation. Moreover, by facilitating communication between members, and shaping the sense of obligation in groups (Hetcher, 1987), it reducing it reduces the risk of conflicts that might undermine the survival of cooperative groups.

Democratic Participation in Decision-Making

It has been suggested that same decision-making processes are at work in production cooperatives as well as in worker-owned firms run by their members. Those organizations could be found in the former socialist Yugoslavia, but they can be found in other countries as well. Several studies done on the role of popular involvement in decision-making in those organizations concluded that full integration of members into the formulation of policies and procedures is instrumental in organizational effectiveness (Patchen, 1976; Rotschild and Whitt, 1986). Similarly, Beal et al. (1962) suggest that members' participation in decision-making is related to cooperative productivity.

Likewise, infringement on popular participation by the government or through internal institutionalized decision-making mechanisms, gives rise to apathy, inaction, and low productivity and failure of the organization (Patchen, 1962; Ryan, 1985). Kabeer (1985) cites the case of a successful fish farm cooperative whose members, all women, participated in the allocation of work assignments and basic pond management operations. For Kabeer, the primary benefit of women's involvement was that it helped to build their self-confidence; it also strengthened their organizational capacities. In another study, Alberti (1976) found that effectiveness of Peruvian plantation cooperatives was somewhat related to the total involvement of members in decision-making.

Democratic participation can take place through active involvement in structurally established decision-making bodies like general assemblies. It can also occur in daily interactions between members. However, effective democratic participation implies democratic access to sources of power used in making decisions or influencing actions and events. One important source of power in organizations is technical knowledge and information. Hopkins (1976) mentions cooperatives in Mali where conflicts occurred because members had differential power and influence, following differential access to information. Those who held information used it to

control the enterprise and influence events in ways that promoted their own interests at the expense of others' interests. Hopkins suggested two ways to propagate information to all members. One was to ensure all members get trained in required job skills. The other way was implement job rotation schemes so that every member enhances his knowledge and experience in all operations.

Democratic participation allows negotiated work assignments to be done to the satisfaction of every one involved. It facilitates both formal and informal control within groups, since members can check on how their partners contribute to the collective endeavor.

Cooperative Education

The importance of cooperative education has been emphasized in the literature on cooperatives more to suggest lack of it is an important factor in the failure of cooperatives in developing countries. Bavia (1991) indicated that an emerging scheme designed to enhance the organizational capacity of cooperatives in the Philippines was cooperative education and training. Rhodes (1991) discussed the need to educate members of cooperatives in business and organizational skills in Sri Lanka and other developing countries. Meghji (1985) reports a case of women's cooperative in Tanzania that failed because of low education

and lack of managerial and organizational skills of members. Meghji suggests that education could serve to enhance self-confidence and self-reliance among women so that they could plan and implement their own programs.

In many developing countries, arrangements are made to promote cooperative education and training. The object and subjects of that education have been summarized in the following terms by Mshiu (1984):

"Efficient performance by cooperative requires that members are properly enlightened as regards the organization and functions of their cooperative, their rights, duties and responsibilities towards it. It also requires that the elected leaders and employees are provided with education and training necessary to enable them to discharge their duties with maximum efficiency (Mshiu, 1984)."

In other words, cooperative education and training is intended for all members, groups' elected representatives and other members. It can be essential in areas where members have low education levels. Education gives members political power that enables them to actively participate and commit themselves to the common enterprise (Pyne, 1984).

Cooperative education and training in developing countries can take several forms. Formal arrangements can be made through institutionalized cooperative training centers like IWACU in Rwanda (Ntavyohanyuma, 1986) or in India (Taimni, 1984).

3.3. Theoretical Model and Research Hypotheses

It was indicated that the purpose of this research is to identify factors that influence fish farm groups' performance, in terms of production enhancement and self-sufficiency. Considerations made about exchange and organizational patterns in cooperative production relations, and empirical findings in the reviewed literature on cooperatives have helped to identify the conditions and circumstances that lead to the organizational effectiveness of cooperatives. In sum, it was observed that an efficient functioning of cooperatives has to be sustained by group cohesion, members' motivation and commitment, groups' ability to secure basic managerial and organizational skills, and an efficient social control system. Members' commitment insures that they are inclined to commit their efforts, labor, and time to the collective effort. Group cohesiveness is meant to imply a common understanding of roles, and cohesive team work. Cooperative standing requires dynamic mechanisms that submit the individual members to social pressures from peers and make them comply with the organizational rules and procedures. Moreover, a better understanding of cooperative rules and obligations must be insured.

There are linkages between those efficiency factors and levels of performance. Indeed, a combined effect of cohesion, motivation, cooperative organization skill, and social

control within a group involves commitment that can be translated into compliance with pond management recommendations and practices. The latter include regular visits to pond, collecting agricultural waste matters used for feeding the fish, collecting animal manure and other appropriate matters used to fertilize the pond, regularly cutting grass around the pond, maintaining proper levels of water in the pond, and so on. A thorough compliance with fish production recommendations and practices can only be expected to boost production. Also, commitment of farmers should facilitate their acquisition of fish farming know-how because "learning is acquiring and improving the ability to perform through experiences and practice (Van Den Ban and Hawkins, 1985).

Towards the development of the theoretical orientation of this study, the approach is to identify patterns of organization responsible for inducing members' motivation, commitment, and shared orientations which function as standards of conduct, and insuring the transfer of cooperative skills to members. It is believed that thoroughly designed organizational structures can offset effects of organizational and managerial dilemmas encountered in fish farm cooperatives in Rwanda.

The following section includes a discussion of the factors suggested to be instrumental for effective and

efficient organization of fish farm cooperatives, which, in turn, affect their overall performance. The discussion involves a model made up of seven groups of factors suggested to be essential in cooperative dynamics, adapted to fish farmer cooperatives in Rwanda. Proposed operational hypotheses indicating the direction of expected relationships are presented as well.

Membership Characteristics

Cooperatives' members can be differentiated on the basis of several characteristics, including, the number of groups' members, gender, age group, marital status, and family and friendliness ties. Those features are expected to affect how members commit their efforts and contribute in fish production collective activities. The key factor here is group homogeneity which is a fundamental element for group cohesion and commitment of members. In the absence of wage incentives and a highly hierarchic structure to control obedience and motivate work and commitment toward organizational goals, common purposes and moral commitment constitute major incentives for people to participate in cooperatives (Rotschild and Whitt, 1986). Moreover, unified action requires some agreement on goals and processes of collective enterprise. If groups are to have common goals, they must have common needs. Membership homogeneity, in terms

of values and goals, and interests, is required to achieve that needed consensus which is expected to be a factor for group cohesion and members' participation.

The following hypotheses that will be tested correspond to each of the membership characteristics. The first characteristic to be considered is the number of members in the group. Membership size can have several structural effects. It was previously suggested that limited membership can be both an impediment and a positive factor of cooperative effectiveness. While it can facilitate group cohesion and enhance motivation, it also can undermine flexibility and work arrangements when collective operations demand a substantial amount of labor. In a study on fish pond practices and perceptions in Rwanda (Molnar et al., 1990) it was found that, among all pond management operations, only pond-digging relatively required a substantial amount of work. According to that study, fish farmers indicated that, once pond-digging has been done, other pond management practices (collecting feed for fish and compost for pond) did not demand as much labor. Most farmers surveyed indicated that they spent one hour or less at the pond to feed the fish and put the compost into the pond. This suggests that the nature of task demands did not require an extensive amount of labor. A small but efficient number of group members could actually handle it. Smaller size is believed to facilitate

face-to-face interactions and communications, making members aware of their mutual interdependence (Cartwright and Zander, 1960; Dawes et al., 1975). Mutual interdependence and intensive interactions are expected to make members more susceptible to social pressures from peers to perform collective duties. Thus, smaller groups should perform better than larger ones, because they are expected to be more manageable and more cohesive than larger ones (Adams, 1978).

Hypothesis 1: The smaller the number of members in groups, the greater the production and the higher the level of sustainability.

Group members have several characteristics that can be a basis for homogeneity. Those characteristics include gender, age group, marital status, friendship, and kinship ties. Group members who share those characteristics are expected to have more group solidarity and identity, mutual trust, and cooperative orientation.

The second characteristic to be analyzed is gender. Groups include male and female participants. It is assumed that the number of male or female members is positively associated with groups' performance. Two hypotheses are derived from that suggestion:

Hypothesis 2: The amount of fish production and the level of sustainability are positively related with the number of male members in the groups.

Hypothesis 3: The amount of fish production and the level of sustainability are positively related with the number of female members in the groups.

The third characteristic is age group. Members are categorized into three groups: young, middle-age, and old members.¹ The number of young, middle-age, and old members is expected to be positively associated with groups' performance. Three hypotheses will be tested:

Hypothesis 4: The amount of fish production and the level of sustainability are positively related with the number of young members in the groups.

Hypothesis 5: The amount of fish production and the level of sustainability are positively related with the number of middle-age members in groups.

Hypothesis 6: The amount of fish production and the level of sustainability are positively related with the number of old members in groups.

The fourth characteristic is marital status. The number of single, married, widowed, and divorced members is expected to positively affect groups' performance. Four hypotheses will be tested:

Hypothesis 7: The amount of fish production and the level of sustainability are positively related with the number of single members in groups.

Hypothesis 8: The amount of fish production and the level of sustainability are positively related with the number of married members in groups.

Hypothesis 9: The amount of fish production and the level of sustainability are positively related with the number of widow members in groups.

¹Details about how age groups were identified are provided in the section on operationalization of variables.

Hypothesis 10: The amount of fish production and the level of sustainability are positively related with the number of divorced members in groups.

The fifth characteristic is friendship. It is theorized that groups within which most members are personal friends will perform better than groups in which members are mere friends. The following hypothesis will be tested:

Hypothesis 11: The amount of fish production and the level of sustainability are positively related with the level of friendship among members in groups.

The sixth characteristic is family/kinship ties. Kinship and family ties are expected to be a factor of commitment and compliance with fish production recommendations. The following hypothesis will be tested:

Hypothesis 12: The amount of fish production and the level of sustainability are positively related with the level of kinship/family ties among members in groups.

Democratic Leadership Style

Important in the leadership process is the leadership style, classically defined as democratic and authoritarian. A democratic leader encourages a work environment where policies, procedures, and arrangements about the division of tasks are decided through group discussion, while in the authoritarian leadership style, the leader decides who should do what, when and with whom (Patton and Giffin, 1978:57-59).

Groups with democratic leadership are believed to perform better because the active participation of the

members is a source of motivation and morale. Patchen (1976:33) remarks that not only does participation enhance motivation, but it also can lead to identification with the organization, making the individual more sensitive to social pressures from group members. Also, group productivity is believed to be related to opportunities available for members' participation in decision-making (Beal et al., 1956:89). On the contrary, in the authoritarian leadership, the one-way leader-member communication patterns and total dependence on the leader can give rise to apathy, inaction, and low productivity. The following hypothesis will be tested:

Hypothesis 13: The higher the degree of democratic leadership, the more production, and the higher the level sustainability.

Cooperative Education and Training

In Rwanda, cooperative education and training is conveyed at least at two levels. Firstly, it was previously observed that it is the job of the organizer of cooperatives to constantly keep the membership better informed with a sense of cooperative purpose. A reminder of members' rights and obligations can be particularly important for production cooperatives in which trust, confidence of members, work discipline, and commitment to the collective cause are necessary for group members to be effective producers. In the second place, IWACU, a non-governmental organization, in

collaboration with the Ministry of Youth and Associative Movement provides management training and cooperative education to members of cooperative associations. Both the quality and intensity of the contacts of the cooperatives organizer with fish farm cooperatives, and the extent to which the latter make good use of IWACU services, will affect their overall performance.

Services from those institutions are expected to shape members' understanding of basic objectives, principles, and obligations in a cooperative enterprise. Cooperative education keeps members reminded of their rights and duties to the collective enterprise. Such a reminder can be a way of pressuring members to meet expectations of contributing their share in accordance with fish production requirements. Groups' performance is expected to be positively associated with the degree of contacts group members have with institutions that provide cooperative education and training. The following two hypotheses will be tested:

Hypothesis 14: The amount of fish production and the level of sustainability are positively associated with the frequency of visits by the cooperative organizers of groups.

Hypothesis 15: The amount of fish production and the level of sustainability are positively associated with the number of group members who have been trained at IWACU center.

Cooperative Experience

The historical background of fish farm groups reveals some interesting features related to the duration and extent of cooperative activities of their members. Indeed, some groups were active even before the implementation of fish farming. Most of these groups grew vegetables as a group activity. They adopted fish farming as an addition to the list of their collective farming activities. For other groups, however, collective fish farming is the primary and only collective activity. Furthermore, it is possible to find group members involved with more than one cooperative inside or outside fish farming. The 1989 annual report of the Rwanda fish Culture Project reveals that some farmers are actually involved in at least two fish farm groups.

These features are important for the organization of the cooperative. The duration of fish farming as a group activity, the duration of overall farming as a cooperative operation and the involvement of group members in several collectives, constitute substantial sources of cooperative experience, which can affect the behavior of members toward participation and commitment to group efforts. It is presumed that throughout the duration of collective farming, farmers get acquainted with the requirements and duties of members in cooperative work. That familiarity and experience with the

functioning of the group activities are a good laboratory to build work discipline, cooperative knowledge, and commitment which are essential in cooperatives.

If in the long-run experience can be an asset for organizational performance, then the duration/period throughout which fish farm cooperatives' members have been working together in a group, should affect how their group performs. Also, experience acquired through engaging in several collective activities, such as fish farming, cattle raising, or others, can play a role in the group's performance. Older groups are expected to be more productive and show higher levels of sustainability than younger groups. Those groups engaged in several collective activities are expected to be more productive and show a higher degree of sustainability of fish farming than groups involved in just a few activities. Two hypotheses will be tested:

Hypothesis 16: The longer fish farmers have been working together in a cooperative, the greater the amount of fish production and the higher the level of sustainability.

Hypothesis 17: The more collective activities cooperative fish farmers are engaged in, the greater the amount of fish production, and the higher the level of sustainability.

Self-Reevaluation

According to the statute governing the establishment and organizations of cooperative associations in Rwanda, self-

criticism is to take place through general assembly meetings, and through the Control and Supervision Council (Presidence de la Republique Rwandaise, 1989). The general assembly is a gathering of all the group members, every body with one equal voice. Discussions relate to the overall objectives, goals, and policies of the enterprise. In a production cooperative, the general assembly also makes decisions bearing the executive management of operations. It can serve as a forum for mutual feedback. The general assembly is to meet at least two times a year. The control and supervision council is made up of at least two members chosen by the group. Its role is to monitor the cooperative activities and report to the general assembly. While the law institutes both the general assembly and the control and supervision council as part of the check and balance process, their mode of functioning is left to the discretion of the association. In a 1985 inventory of cooperative associations in Rwanda in which their organizational and management features were recorded, it was found that a large number did not hold the general meeting in that year, and did not have any control and supervision council (Ntavyohanyuma, 1987). In those groups the level of members' participation in running the enterprise, and chiefly their opportunities for self-examination were rather low. By inference, inadequate

opportunities for self-criticism can have deleterious consequences for the group performance.

Feedback among group members can serve several purposes. It represents a self-enriching process whereby members exchange ideas on operations that are helpful in their efforts to achieve their goals. It also constitutes an opportunity to self-correct and apply pressure to group members who fail to comply with fish production requirements and practices within a group. Groups with higher levels of self-reevaluation are expected to perform better than those with less feedbacks. Two hypotheses will be tested:

Hypotheses 18: The amount of fish production and the level of sustainability are positively associated with the frequency of General Assembly meetings in groups.

Hypothesis 19: The amount of fish production and the level of sustainability are positively associated with the frequency of reports by the Control and Supervision Board to the General Assembly in groups.

Knowledge Sharing

One of the major bases of power in organizations is the access to skills and expertise needed to perform organizational tasks (Crozier, 1984; Weber, 1968). Whoever controls that knowledge monopolizes a substantial source of power which can be utilized to influence the decision-making and the course of actions. Accordingly, any differential control of that knowledge means a differential access to power and influence among members of the

organization. In egalitarian groups, attention has to be paid to the process of knowledge diffusion to avoid a biased redistribution of power base against some members in favor of others (Hopkins, 1976).

Such comments apply well to fish farm cooperatives in which collective action is the principal vehicle for delivering tilapia production technology, knowledge and skills. In line with the discussion above on power bases in organizations, differential control of technical skills in fish production can be seen as a precondition for the diffusion of influence among group members. The transfer of fish production knowledge is done by extension agents at the time of their visits with farmers. However, if egalitarian principles are to be maintained, the transfer of knowledge must be done in such a way that professionalism and specialized expertise are avoided in order to prevent differences in access to power bases that eventually could in the long run cause inequality and tensions (Rotschild and Whitt, 1986).

Favoritism in diffusing knowledge can take place when, for example, the extension agent finds it easier to devote more attention to those farmers who learn more quickly, while training equally all the group members at the learning speed of every one may take a great deal of time, energy, and patience. Such favoritism not only can cause influence-

related internal conflicts, but also, it can lead to poor performance of those farmers who received inadequate attention of the extension agent. Disparities in farming knowledge are structural features that can undermine the performance of farm cooperatives. Respect for egalitarian and democratic principles legitimizes collective efforts and will facilitate a smooth compliance with group requirements. On the contrary, any thing that can cause great differences in the ability to do group tasks can also cause dissension in the group and undermine its functioning. As fish farming technical knowledge represents a substantial source of power and ability to perform, groups' structural features are to be such that those differences in access to fish farming knowledge are prevented.

Job rotation is believed to be an excellent way to redistribute knowledge to all cooperative members (Hopkins, 1976; Rotschild and whitt, 1986). It is an insurance and an opportunity to all members to develop skills, experience and expertise in overall operations. For fish farmers, job rotation implies that every member gets to spend some time doing each of the specific tasks required for fish pond management (maintaining proper water level, collecting feeds for fish, collecting the compost to fertilize the pond, cutting the grass around the pond). As such, it should create conditions for improving groups' performance because members

can relatively gain equal fish farming knowledge, and power imbalances are avoided. The following hypothesis will be tested:

Hypothesis 20: The amount of fish production and the level of sustainability are positively associated with the extent to which every member does all operations at different times, on a rotational basis.

Equitable Sharing of Contributions and Benefits

Effective equal sharing of benefits suggests that fish farmer cooperatives operate with the understanding that labor, time, and material contributions are equal. Equity can be a source of conflict between group members. Perceived preferential treatments are illegitimate and could jeopardize some members' commitment to the collective effort.

Yet, it is unconvincing to argue that contributions that each fish farmer cooperative member makes equal to those of peers because no systematic monitoring of labor or material contributed is done. However, groups have devised mechanisms to compensate for perceived imbalance in contributions. Monetary compensations, substitutions by family members, and work shift postponement are used to compensate for failure to provide labor. Those practices carry some symbolism. Indeed, an absent group member cannot be effectively substituted by some one who may not have the same fish farming expertise; and because regularly administered feed and care are major

factors both for the growth and reproduction of fish in ponds, they cannot be replaced by monetary fine or work postponment without damaging the standing of fish. Nevertheless, those compensatory practices constitute sufficient rationales used by group members to value and restore equity.

Similarly, the extent to which groups fully implement those practices should impact on their ability to maintain norms of equity. Groups in which those mesures are complied with are expected to perform better that those in which the practices are not implemented. The following hypothesis is suggested:

Hypothesis 21: The amount of fish production and the level of sustainability are positively associated with the extent to which groups implement compensatory measures.

Chapter 4

METHODOLOGY

4.1. Unit of Analysis

This study focuses on the organization as a whole, attempting to discover the extent to which organizational structures and work processes in farmers' cooperatives (e.g., membership, size, work arrangements, division of labor, control and authority patterns, and so forth) are related to their relative successfulness. The unit of analysis is the fish farm cooperative as a whole or entity. Fish farm cooperatives operating within the project area constitute the target universe to which the results of this study are generalized.

The analysis of cooperative organizations as whole entities avoids the error of equating an organization with its individual members. Such an idea would prompt the researcher to handle organizational studies solely relying on information provided by anyone of its members. However, doing so ignores the dialectic nature of the relationships with its individual members. Indeed, once established, an organization becomes a corporate body, a distinct entity in its own right, with its own structure, identity, and code of conduct, separate from that of its individual members (Blau, 1974; Roy, 1981). The problem is to gather data that characterize a fish farm cooperative as an organizational entity.

4.2. Sources of Information

Given the objective of the study and the nature of the unit of analysis, aggregate information on the structural features of fish farm groups was the basis of analysis. Two sources of information were used, including secondary data from the RFCP archives, and survey interviews of group members. In the first instance, descriptive data were gathered from reports and archives kept at the headquarters of the RFCP. Those archives contained a list of all pond operations benefitting from the project services. For every pond operation, those archives contained information on: 1) the commune in which the pond is located; 2) the type of unit of operation, distinguishing group ponds from individual ponds; 3) the quantity of fish production in kilograms; 4) the size/area of the pond in hectares; 5) the time of harvest; 6) the number of members in groups; and 7) the gender composition of groups.

Such information was particularly useful for determining production figures in kilograms for pond operations. The information on membership size and gender composition also was useful for this study as part of the independent variables. Furthermore, archives data were used to cross-check respondents' answers to the questionnaire. The second source of information involved survey interviews designed to uncover structural characteristics of fish farm

cooperatives. In effect, because a fish farm cooperative is the unit of analysis for this study, interviews were administered to cooperative members who knew how work arrangements were made in their respective cooperatives. For this type of study the most appropriate sampling frame would be a complete census whereby all members of any selected group are interviewed to give their account of cooperative organizational features. Such an undertaking largely depends on the total number of interviews to be done and the time and financial means at the researcher's disposal. In a sample of 36 groups contacted during the pre-dissertation field research in Rwanda in 1989, group sizes ranged from 4 members for the smallest group to 23 for the largest group. Most groups had between 12 and 15 members. If those group sizes were to be referred to as a guide, a total of at least 800 interviews would have to be carried out to complete a census of at least 200 groups. However, financial support was obtained to cover the costs for only 600 interviews. A census can still be done, but on the condition the number of sampled groups be substantially reduced, jeopardizing the empirical statistical meaningfulness of the study. The census appeared practically impossible if a number of groups large enough to allow significant statistical tests was to be

maintained and within the financial resources of the researcher.

Instead, key informants including groups' leaders were interviewed and asked to provide their perceptions of the situations and experiences as related to organizational properties and processes of their respective groups.

Each group has a President, a Vice-President, a General Secretary, and a Treasurer. Those farmer leaders were elected by their peers. They were basically responsible for the coordination and administration of groups' activities by presiding over decisions on who does what and when. They arrange and chair group meetings in which members discuss issues concerning all group activities. Upon consultation with an extension agent assigned to the group, leaders get involved in decisions about when to harvest and how to dispose of the harvest. By virtue of their position and function in their respective cooperatives, group leaders possess, to a large degree, a solid factual knowledge about the managerial and organizational attributes of their groups. Such knowledge can be a valuable source of information on the structural/organizational properties of groups (Heydebrand, 1973:38).

The insistence on group leaders as the interviewees for this study was dictated by the need to overcome the problem of group representativeness especially because part of the

information is to come not from all group members, but from a few of them. Heydebrand (1973) suggested that getting information from resource informants (e.g., group leaders) can be an adequate approach. Moreover, group representativeness will be further enhanced in the formulation of the questionnaire instrument by using indicators that are as objective as possible, and asking questions that reflect overall and general features of the fish farm groups for the sake of validity (Heydebrand, 1973:38).

Even though each group has four individuals in the executive committee (group leaders), it was decided to interview only three, asking them to respond to questions characterizing their group's ability to self-help in fish farming, leadership authority, cooperative education, communication and diffusion of knowledge, and so forth. A questionnaire was developed for that purpose.² The number of 3 interviewees per group was decided for two main reasons. First, it was believed that three interviews in a group would help reduce bias as much as possible in order to secure as much reliability information as possible (Kerlinger, 1973). That was done in response to the felt need to get accounts of one group characteristics from several members belonging to

²The questionnaire is shown in Appendix B.

the same group. It was believed that a combination of several accounts would produce a more objective picture of the group's features. Second, the number was set following the decision to have 200 fish farm cooperatives as the main sample frame for the study. According to the 1988 figures, 200 fish farm groups represent 46% of all fish farm group operations in the two districts covered by the study, and 17% of fish farm cooperatives in the whole country (FCPR, 1989). It was believed that a number of 200 groups is large enough to allow meaningful statistical analyses and interpretations. With a sample of 200 groups, three interviews per group allowed a total of 600 interviews for which the costs could be covered. The selection of fish farm groups and respondents is outlined in the section on sampling of this chapter.

4.3. Research Site

The basic design of the study is a cross-sectional case study of farmer groups in the Butare and Gikongoro Districts in Rwanda. The selection of the site was primarily dictated by the need to control for the variability of physical components of fish farming that can influence the relative performance of groups. Some physical features have to be controlled for because they are independent of social organization. Those are, for instance, the temperature in the

soil which facilitates the decomposition of organic matters in water, and local availability of feeds. Butare and Gikongoro are two adjacent districts located in Southern Rwanda.³ They are classified in the same agro-climatic zone, based on the country's variations in elevations, temperatures, precipitations, and soil characteristics. It was assumed that fish farm operations in that region are submitted to the same soil temperatures, agro-climatic conditions, and availability of local feeds used in ponds.

Also, the region shelters the headquarters of the fish culture project located at about 20 km from the city of Butare, in the small community of Kigembe. It has pioneered in benefiting from the project services. For that reason, it registers most fish ponds and most fish farm groups (38% of the whole country which had 1134 in total), as indicated in the 1987 and 1988 annual reports of the project activities. The 1988 report indicates that Butare and Gikongoro all together had 431 fish farm groups in 20 different communes. Based on information contained in the 1987 and 1988 reports that show a continuous trend of starting new ponds, and referring to the high level of popularity enjoyed by fish farming in Rwanda (Molnar et al., 1990), it is not surprising to find that the number of fish farm groups has increased. In

³A map of Rwanda is illustrated in Appendix C.

1990, Butare and Gikongoro had 472 fish farm groups in 19 communes (RFCP, 1991).

Even though this study is focused on fish farm groups in Butare and Gikongoro, the aim is to use the findings to make inferences for the whole country. This can be done because organizational characteristics are the ones put to test here, and this study is working under the implicit assumption that similar organizational characteristics can be found in organizations that have the same objectives and relatively identical structural features.

4.4. Field Work Preparation

Though not directly associated with the operation of collecting data, several contacts cleared the way and facilitated the research operations. Indeed, in addition to personal contacts, letters were sent to the Coordinators of Agricultural Services in both the districts of Butare and Gikongoro to notify them of the undertaking and request their approval, which was granted. District coordinators supervise all operations and personnel associated with agricultural activities in communes, including the fish farming extension staff. Their approval established some legitimacy to the endeavor and facilitated contacts with fish farming extensionists and with fish farmers themselves.

Fish culture extensionists were contacted in their communes. They included 15 from Butare and 2 from Gikongoro. They were told about the study and were asked to provide needed information and help to locate farmers to be interviewed. They were left with papers and self-addressed stamped envelopes, and were asked to provide information on gender, age, and the number of fish farm group members they work with in their zones. After one month, all information was sent back by the extensionists and received. This information was useful in sampling.

Contacts were made with three interviewers who had some interviewing experience. Training sessions were organized to acquaint the interviewers with the overall objective of the study, review and explain the questionnaire, and provide suggestions on interviewing.

4.5. Sampling of Fish Farm Cooperatives

Prior information on the characteristics of group members was gathered during the pre-dissertation field research conducted in Butare, Rwanda in June of 1989, and supported by a fellowship from the Social Science Research Council. It was found that fish farm groups were of two types. The first type included young and single men and women. The second included older people who generally were married. In addition to youth groups, cases were reported of

mixed groups comprised of married men and women. However, women in groups of men tended to be widows who became members to replace their deceased husbands. Cases were also reported where young men became members of groups of older people to take over their father's place, once the father was no longer alive, or when the father, because of age, could not support the heavy duties of working for the enterprise. It was expected that those features of fish farm cooperatives would be represented in the sample.

Upon reception of data sent back by the extensionists, a list of all group pond operations in the area covered by the study was made, and groups were numbered. A simple random sample was used to select a total of 200 groups, using a table of random numbers (Blalock, 1972).

All 17 communes receiving the RFCP extension services were represented by at least two cooperatives in the sample. Sample cooperatives distinguished themselves by the gender composition of members which featured a predominance of all-male and mixed groups among the 200 sample fish farm cooperatives. Male groups represent more than half of the sample, reflecting a general uneven gender distribution among fish farm operators where males by far are overrepresented (Molnar et al, 1989). Tables 1 and 2 in the Appendix respectively show the distribution of sample groups per

commune and distribution of groups according to the gender composition of their members.

4.6. Survey Research and Profile of Respondents

The study called for field research whereby information was collected through direct interviews with farmers. Any other alternative form of information gathering from farmers was practically and logistically impossible. Survey research not only allowed for the collection of data on organizational characteristics, but it also made possible the cross-checking of archives data, in particular fish farm annual productions.

Farmers were interviewed in their villages in the native Kinyarwanda language. When it was time to conduct the interviews, the interviewer made an appointment with the extensionist, who helped to locate the respondents: group leaders from sampled cooperatives. Then, the interviewer made appointments with three of the four group leaders at an agreed upon time and place. Most interviews took place in the open air, while others were held in nearby cell (county) offices. One interview lasted on the average 40 to 50 minutes. The three hired interviewers did 300 interviews altogether, while the principal researcher completed the remaining 300.

Prior to the extended survey work, pre-test sessions were organized. The survey instrument was pre-tested on a

small number of respondents to allow the checking of the appropriateness of the terminology employed. Revisions were made if needed. To supervise the interviewers, the researcher saw each one every two days. They read over every completed schedule to ensure all questions were answered in the proper way. All 600 interviews were completed by April 24, 1992.

The following is a brief discussion of some of the characteristics of the 600 interviewees, focusing on their gender and function differences in the groups. Those attributes can shape how the respondents interact with other group members. As such, those attributes can influence the interviewees' opinions about their organizations. As expected, male were overrepresented among the respondents. They comprised 522 of 600, or 87%, while their female counterparts represent only 78, or 13%. Group presidents and secretaries interviewed were respectively 200 and 191, or 33% and 32% of the total number of respondents. All 200 sample groups' presidents were interviewed, while only nine secretaries failed to be interviewed. They all together make up 65% of the interviewees. Vice-Presidents and Treasurers respectively make up 113 and 96, or 19% and 16% of all respondents. Therefore, the bulk of input and information used in this study came from both groups' Presidents and Secretaries. There were two female Presidents for the two

all-female groups. Women held various responsibility positions in mixed groups, including Vice-President, Secretary, and Treasurer. The majority of female respondents (41 of 78) were Treasurers in their groups. Table 3 in the Appendix shows the distribution of respondents according to their gender and according to the functions they hold in their groups.

4.7. Operationalization and Measurement of Variables

Measures of some variables used in this study are objective and were straight-forwardly recorded from archives or through interviews. Those particularly were fish production and the lifetime of fish farm cooperatives. Records of quantities of harvested fish, measured in kilograms, were found at the headquarters of the RFCP. Fish farmers objectively indicated how many years they had been working together as a group. However, other measures were constructed on the basis of group members' accounts of their groups' characteristics. This section includes an outline of all dependent and independent variables and their measurement. Also discussed in this section are the procedures used to obtain measures of groups' characteristics. Throughout, an illustration is given of steps taken to check the reliability of information, based on an assessment of the extent to which group members concur in

their accounts. In effect, because information on each group comes from three of its members, the extent to which responses from the three interviewees converge provides some indication about the quality and reliability of the measure, while wider dispersion of scores indicates unreliable measurement instruments.

4.7.1. Dependent Variables

The study represents an attempt to analyze the performance of fish farm cooperatives, viewed as intermediate organizations in rural development. One way to test organizational performance is through testing goal achievement. The test consists of studying the extent to which the organization fulfills its objectives. The performance of fish farm cooperatives is analyzed on the basis of two criteria judged as imperatives of rural development. These include: 1) the group's ability to induce agricultural development through increased agricultural production; and 2) the group's ability to build and shape self-sufficiency in fish farming.

Production:

Agricultural development is often seen as a prime mover or a necessary precondition for the overall development of a country. Some believe that if high-income countries today

were able to develop, it is because of agricultural development in such a way that the development process involved the transfer of surplus capital and labor from agriculture to other non-agricultural sectors of the economy (Johnston and Mellor, 1961; Mellor, 1966). The role of agricultural development appears more imminent in countries in which the majority of the people live in rural areas. Agricultural development can make at least three contributions in rural development: 1) ensuring a sustained food supply; 2) providing a dependable source of income; and 3) securing employment opportunities.

An effective agricultural development effort entails agricultural growth evidenced in increases in agricultural production. The effectiveness of fish farm cooperatives can be studied by looking at the extent to which they gradually raise fish production. Group production is the quantity produced per group during a certain period of time. Production figures can be found in records that are available at the headquarters of the RFCP. Always present at the time of harvest, fish culture extensionists have to record the quantity of fish harvest (in kilograms), and report it to the RFCP. This study used the 1990 production figures, or the sum of cooperatives' latest 2 harvests.

A derivative of production is productivity. Productivity provides some indication on how efficiently productive units

use their production factors to produce some expected output. A productive unit is said to be efficient when, at any given level of resource input, the largest amount of output is achieved (Parker, 1990). Because group action is an issue here, cooperative performance can also be measured by the per capita productivity which can be obtained by dividing production by the number of members for each group. Such a measure can be used to derive the marginal value productivity of labor/members in cooperatives which would provide some idea about how much of fish harvest is accounted for by any one additional member in the cooperative. In principle, that measure could show diminishing returns in the fish production function, implying that, beyond one determined number of cooperative members, the overall cooperative production might go up, while the incremental value added per any additional group member is decreasing (Quirk, 1986). The overall group production may increase with membership size, when individual benefits are declining.

Relying upon productivity as an efficiency indicator suits profit-maximizing business organizations or productive units working under strictly economic objectives. In such organizations, individual accomplishments are very important both for the organization and for the individual. Indeed, since groups have the priority for obtaining access to land and fish pond technology, a higher value seems to be placed

on social and symbolic goals of cooperative enterprises rather than on their economic objectives. While the government may find in cooperatives a way to redistribute land and fish culture technology to a larger number of farmers, farmers may get symbolic satisfaction from the privilege of getting access to land through collective action (Molnar et al., 1990).

Cooperatives can still be preferred even if they are not efficient in strict economic terms. Economic deficiencies may be outweighed by the social and symbolic security cooperatives offer. Moreover, for operational and practical reasons, per capita productivity can better be applied in situations where individual efforts and contributions to the organization can be systematically monitored and assessed. In modern complex organizations, for example, a track of individual performance and achievements can be kept through the assignment of specific task that must be done within a determined time frame. Subsequently, rewards and benefits such as salaries that members receive are determined based on the perceived separate contributions of each participant to the organization's outcome.

In fish farm cooperatives under investigation here, more value seems to be put on communal efforts and responsibilities than on individual accomplishments. In effect, what appears to matter most is individual

participation in collective effort, not the amount of effort. There is no systematic accounting of time and material individual contributions. Members do not monitor how much fertilizers each participant collects from home to fertilize ponds. In addition, during the pre-dissertation field work, it was discovered that two actions were taken when members failed to participate in collective farming. They paid a monetary fine equivalent to the minimum salary for a daily manual work, or they are replaced by someone in their families. Also, it was found that some groups had women and younger members who joined the group only to take over for deceased spouses or parents. Contributions from those replacements are expected to be modest and somewhat symbolic because they do not have as much fish farming expertise and experience as other veteran members. Actually, it may be that some members work harder, give more time, and contribute more than others.

However, despite apparent differential contributions, members get equal shares at harvest. The benefits members perceive are not based upon the amount of individual contributions. Fish farm cooperatives behave like the Moose, a farming community in Ivory Coast which Fiske (1991:260-262) describes in these terms:

"Moose share the responsibilities and the effort communally, thinking of the work as "ours," as something to do together as whole group."

According to Fiske, the Moose practice communal farming and sharing of benefits regardless of how much contributions individual members provide to the common good. Like in the Moose community, what seems to be important in fish farm groups is group production, not the per capita productivity.

The use of per capita productivity can have important policy implications for fish farm cooperatives. Indeed, because fish production is equally shared among group members, decreasing productivity can lead to a situation in which additional members beyond the optimal number provoke declining individual benefits. Because members only can expect to get little share of fish, they may lose the motivation to remain in the cooperative. When there is evidence of declining productivity, cooperatives may be encouraged not to exceed a certain number of members, in order to safeguard their long-term viability.

In this study aggregate group production figures were used as one dependent variable because, not only economic gains were not the primary objective of fish farm cooperatives, but also communal production seemed to be more important than individual productivity. However, production per member will be briefly used in the analysis in order to examine how membership size affects labor productivity in fish farm cooperatives.

Sustainability:

Self-sufficiency can be stimulated by enhancing farmers' access to technical knowledge, and provision of managerial resources and inputs. In the context of fish farming, one significant aspect of farmers' ability to forego the RFCP assistance lies in their ability to produce and maintain their own seed fish, and ability to execute fish culture operations without extension assistance (Molnar et al. 1991). For operationalization purposes, self-sufficiency is measured through a self-rated assessment of farmers' ability to do pond management operations without the presence of RFCP extension agents.

To measure self-sufficiency in fish farming, an index was constructed, based on an adaptation of similar indices and scales which have been used to measure group structural characteristics and dynamics in different situations. Those indices include Hemphill's Index of Group Dimensions and Hagoel's Friendship Value Scales (Miller, 1991). That measure was built as follows. During the interview, the following six statements were one after one read to the respondent:

- 1) Every member of your cooperative knows the appropriate feed for fish.
- 2) Every member of your cooperative knows the appropriate fertilizers to put in the pond.
- 3) Every member of your cooperative can estimate the adequate level of water in ponds.
- 4) Every member of your cooperative can tell when the fish is mature enough to be harvested.

- 5) Every member of your cooperative knows enough about fish farming in such a way he (she) can do without the extensionist assistance.
- 6) Every member of your cooperative can produce and maintain the seed-stock.

Respondents were then asked to respond by selecting either one of the following items, adapted from a Likert-type scale (Miller, 1991):

1. Strongly disagree.
2. Disagree.
3. Agree.
4. Strongly agree.

A score of 1 indicates a low level of mastery of fish farming technique, while a score of 4 indicates a high degree of knowledge of fish farming for the item considered. A mean score of the three interviewees' responses was computed, by summing up their scores, and dividing them by three. Mean scores obtained in that manner are very important for this study since they are considered group scores associated with one particular group characteristics conveyed in a corresponding statement.

To assess the reliability of information provided by the three interviewees for each statement, variances were computed to measure the dispersion in the distribution of the three scores (Loether and McTavish, 1974). The idea was to conduct an exploratory analysis designed to find out how much agreement there was within groups. A high level of agreement is expected to indicate more reliability in the information,

while less agreement, manifested in great diversions, indicates undependable data. Toward that end, variances of the three respondents' scores corresponding to each of the six statements were computed. As reported in Table 4 of the Appendix, obtained variances suggest that there is relatively substantial agreement within groups about how much fish farming knowledge group members have about pond management operations. Indeed, observations are identical (variance=0.00) in three fourth of all sampled groups.

After the calculation of group scores, an index measure was computed by summing up the six group scores.

The summated measure of self-assessment of fish farming knowledge has a scale ranging from 6 through 24. The value 6 depicts the lowest level of fish farming knowledge, while 24 represents the highest level. A value of 15 represents a half-way mastery of fish farming knowledge.

Overview of the Dependent Variables:

Cooperatives' performance is determined through group fish production and self-sufficiency of fish farming operations. Production measures the quantity of harvest per group. Self-sufficiency is reflected in farmers' self-rated assessment of their ability to maintain feed stock and do fish farming independently of extension services from the RFCP.

Production and sustainability are used as two dimensions of fish farm cooperatives' performance. Production refers to the group's ability to secure adequate and growing amounts of fish. Rather, sustainability is a long-term goal referring to the group's ability to assimilate tilapia production technology.

The two are different notions, at least on a conceptual level. Indeed, sound management and adequate inputs seem to be the principal correlates of production. Sustainability depends largely on the nature of the innovation. A less complex and less expensive technology may be more sustainable. Situations may occur when production is enhanced, following a greater activation by the extension agent. In other respects, farmers may know how to apply the tilapia production technology, but do not have the will to apply their time and expertise to improve the group's production, following organizational failures to mitigate major internal conflicts (Zusman, 1990). A zero-order correlation was computed between the two ($r=.0989$), suggesting a substantial empirical statistical difference between the two dimensions of cooperative performance.

4.7.2. Independent Variables

Independent variables are divided into seven categories, including: 1) membership characteristics; 2) leadership

style; 3) cooperative education; 4) cooperative experience; 5) self-reevaluation in groups; 6) Knowledge sharing; and 7) equitable treatment.

Membership Characteristics:

Membership characteristics include several indicators. Interviewees were asked to indicate how many of their group members were male, and how many were female. They indicated how many in the group were single, married, widowed, and divorced. Furthermore, they gave some idea of the age structure of group members by indicating how many were 15-25 years old, 26-45 years old, and 46 or older. The three age groups were arbitrarily selected to respectively correspond to young, middle-age, and old life stages of people. According to the national census conducted in Rwanda in 1978, 25 was the average age at which most males get married (Bureau National de Recensement, 1984). Most young men who cannot continue their studies in high school start doing farming activities at the end of primary school, when they usually are 15 years old. Those who are 15 through 25 years old seemed to represent a group of people who can be qualified as young. Moreover, it was felt that those approaching 49 years, Rwanda's life expectancy (World Bank, 1990), can be qualified as old. It was decided to include in this group all those who were 46 or older. The age group between these two groups was qualified as middle-age. This

group seemed to be composed of people with family responsibilities and who practically were very active, devoting their time and efforts to providing for their families. This categorization was based on male demographic traits because the population of fish farmers is predominantly male. Furthermore, respondents were asked to indicate how many in the group had family relationships, and the extent to which members in the group were personal friends. In short, membership characteristics included 12 measures, including: the total number of members who compose the group; gender identified as the number of male members, the number of female members; marital status identified as the number of single members, the number of married members, the number of divorced members, the number of widow members; age identified as the number of young members, the number of middle-age members, the number of old members; the extent to which group members have family relations; and the extent to which group members are personal friends.

Leadership Style:

Leadership style is measured by a summated scale consisting of three items/statements to which the interviewee responded. It is a readaptation of Likert-type Scale, Hemphil's Index of Group Dimensions, and Hagoel's Friendship Value Scales. It is constructed as follows. Statements

submitted to the respondent depicted how often the group leaders make important decisions concerning collective fish farming activities. Those statements were as follows:

- 1) Only group leaders decide on the date a group member reports to the pond.
- 2) Only group leaders decide on who does which operation.
- 3) Only group leaders decide on the date to harvest.

Those statements were read to the interviewee who then was asked to respond by one of the following:

1. Never
2. Rarely
3. Sometimes
4. Often
5. Always

The score 1 was indicative of a highly democratic leadership style, a score of 5 indicated a highly authoritarian leadership style, while a score of 3 indicates half-way between a democratic and authoritarian leadership style. For each item, a group's score was calculated by computing the mean score of the three respondents' scores in each group. Individual scores were summed up and divided by three. The group score ranged from 1 through 5.

To assess the level of dispersion of observations within groups, variances of the three scores were computed and reported in Table 5 of the Appendix. Those variances suggest a high level of respondents' agreement about the patterns of decision-making in their respective groups. Observations

were identical (variance=0.00) in almost all sample groups.

Leadership style was indicated by the extent to which group leadership is democratic or authoritarian, which was the summated group mean score. Its values range from 3 through 15, 3 representing a highly democratic leadership style, 15 depicting a highly authoritarian leadership style, and 9 indicating half-way between a democratic and authoritarian leadership styles.

Cooperative Education:

Cooperative education is measured by two indicators. Firstly, respondents were asked the following question: How often does the cooperative organizer visit your cooperative? Respondents were to reply by selecting one of the response items designed to provide some ordered intensity to group members' accounts of how often the cooperative organizer visited their group:

1. Once a week
2. Once a month
3. Once a term
4. Once a semester
5. Once a year
6. Never

As suggested by variances of respondents' scores, most respondents agreed on the frequency of visits by the cooperative organizer to their respective groups.

They made identical observations (variance=0.00). Those variances are reported in Table 6 of the Appendix.

The frequency of visits by the Cooperative Organizer was used to indicate how often the cooperative organizer visited the cooperative to extend some cooperative principles to group members.

Secondly, respondents were asked to indicate how many members in their group have benefitted from cooperative education and training offered by IWACU center. Interviewees indicated the number of members in their group who have benefitted from cooperative education and training offered by IWACU.

Cooperative Experience:

Cooperative experience is measured by two indicators. Farmers indicated the number of years the group has been involved in fish farming as a collective enterprise.

Respondents were then asked to indicate other types of productive activities they do collectively, by stating whether they were growing food crops, raising cattle, making crafts, or whether they were involved in small industry like brick-making. For each group, the number of activities the group does collectively was recorded and used as one indicator of cooperative experience.

Self-Reevaluation:

Self-reevaluation is measured by two indicators. Interviewees were asked to indicate how many times the general assembly holds its meetings throughout the year. They

had to chose a response from the following:

1. Once a week
2. Once a month
3. Once a term
4. Once a semester
5. Once a year
6. Never

Then, respondents were asked to indicate whether or not the group had a Control and Supervision Board. When it did, respondents indicated how often the Board makes reports to the assembly. Responses to the statement were:

1. Once a week
2. Once a month
3. Once a term
4. Once a semester
5. Once a year
6. Never

For these two statements, variances of respondents' scores were computed and are reported in Tables 7 and 8 in the Appendix. A large majority of respondents had identical observations (variance=0.00) about the frequency of General Assembly meetings and Control and Supervision Board reports, suggesting a high level of agreement about those group characteristics.

Response items provide some ordering of group members' accounts of the frequency of self-reevaluation opportunities. Self-reevaluation is measured by three indicators. Frequency of General assembly meetings indicates how many times general assembly meetings take place throughout the year. Frequency of Control Board Reports indicates how many reports the Control Board has submitted, if any.

Knowledge Sharing:

Knowledge sharing is measured by one question determining the extent to which each group member practically does all pond management activities, on a rotation basis. The following statement was read to interviewees:

Every member in your cooperative basically gets to do all operations at different times, on a rotational basis.

Interviewees responded by choosing one of the following:

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly disagree

The design of response item also was a readaptation of Likert-Type Scale. Respondents had to answer by one of four items. Scores were summed up and divided by three to obtain the group score used in statistical analysis. How much dispersion there was within groups about job rotation patterns was indicated by variances of respondents' scores. Those variances are reported in Table 9 of the Appendix. They suggest a substantial within-group-agreement about the characterization of job rotation; 178 over 200 of sample groups reported identical observations (variance=0.00).

Equitable Treatment:

Equitable treatment is measured by a question determining the extent of compliance with arrangements designed to offset lacking labor contributions. The following statement was read to respondents:

When a member is sick or cannot do his (her) work for one reason or another, what does he (she) do to compensate for lack of labor contributions?

Then, respondents replied by choosing one, two or all three of the following:

1. Monetary compensation
2. Replacement by a family member
3. Allowed to do it at a latter time

The total number of implemented arrangements was recorded to indicate the extent to which groups implement arrangements used to compensate for failure to provide labor contributions. That number ranged from 1 to 3.

4.8. Descriptive Presentation of the Data

Completed interview schedules were brought on the researcher's return back to the United States in early July, 1992. Data entry, coding, codes checking and editing were all done by the researcher in the computer lab of the Department of Sociology, Louisiana States University, using Program Editor, one of many procedures for data processing. The computation of variances of observations and their distribution within groups as previously seen, and subsequent data analysis used SPSSX (SPSS, 1983) computer program to provide statistical descriptions and test results.

Overall 23 variables were identified, including 2 dependent and 21 explanatory variables. The dependent variables define levels of fish farm cooperatives'

performance, while the independent variables comprise a set of seven categories of structural/organizational concepts. The following is a list of all the variables used in the statistical analysis of this study:

Dependent Variables:

1. Yp: Production: figures are provided in kilograms of fish harvest.
2. Ys: Sustainability: operationalized by a summated measure of self-assessment of fish farming knowledge.

Independent Variables:

1. Membership Characteristics:

- X1: The number of members.
- X2: The number of male members.
- X3: The number of female members.
- X4: The number of people 15-25 years of age.
- X5: The number of people 26-45 years old.
- X6: The number of people 46 years of age or older.
- X7: The number of single/non married members.
- X8: The number of married members.
- X9: The number of widow members.
- X10: The number of divorced members.
- X11: The extent to which group members are friends.
- X12: The extent to which group members have family relationships.

2. Leadership Style:

- X13: The extent to which the group leadership is democratic or authoritarian.

3. Cooperative Education:

- X14: The frequency of visits by the cooperative organizer.
- X15: The number of group members who received cooperative training at IWACU center.

4. Cooperative Experience:

- X16: The number of years the group has been together doing fish culture.
- X17: The number of productive activities group members are collectively engaged in.

5. Self-Reevaluation:

- X18: The frequency of meetings the general assembly does per year.
- X19: The frequency of reports the control and supervision board submits to the general assembly.

6. Knowledge Sharing:

X20: The extent to which each group member practically does all required activities on a rotation basis.

7. Equal Treatment:

X21: The extent to which group implement arrangements used to compensate for failure to provide labor

In order to give the reader a quick descriptive summary of the data at hand, certain measures of central tendencies and variability were computed and are shown in Table 10 of the Appendix. Those measures are the minimum, maximum, mean, median, mode, frequency of mode score, skewness, and kurtosis. Those indices provide some idea on features of the values/scores of each variable and their distribution (Bohrnstedt and Knoke, 1988). Several observations can be made, based on those statistics. Group sizes of sampled fish farm cooperatives range from 3 members for the smallest group to 57 for the largest group. The number of all fish farm operators in the 200 sampled cooperatives is 2,480, for an average of 12.4 members per group. Some groups were not represented in several categories of members. This observation is suggested by a minimum of 0 or a median of 0. Indeed, some groups did not have any male, female, youth, middle age, old, single, married, widow, and divorced member. Some groups did not have any member who benefitted from training at the Cooperative Education Center, IWACU. Some groups got their cooperative education/information only from the cooperative organizer, but never from newspapers, radio programs, local authorities, or any other source. Fish

farming was the only collective productive activity some groups were engaged in. Certain groups did not have any Control and Supervision Board.

One striking aspect of the data is the fact that some variables enjoy great weight in their prevalence in the sample, while others are barely represented. This is particularly true for the demographic characteristics, including the number of females, youth, middle aged, old, widows, and divorced in fish farm cooperatives. The frequency of mode tells how many groups were not represented in various categories of members. Likewise, about half of the sample fish farm cooperatives (91 over 200) did not have any female member. More than half (119 over 200) of fish farm cooperatives did not have anybody characterized as old; 77% (154 over 200) of all selected fish farm groups did not have any widower member; 92% (184 over 200) of the selected fish farm cooperatives did not have any divorced among their members; 94% (188 over 200) of sampled fish farm groups not send any member to be trained at IWACU center.

The above observations do not necessarily imply a lack of representativeness of the sample, as long as it is understood that "representative means to be typical of a population," and "a representative sample means that the sample has approximately the characteristics of the population relevant to the research in question (Kerlinger,

1973:119)." In fact, it may be the case that the above observed demographic characteristics, especially females, are under-represented in fish farm operations throughout the whole country (Molnar et al., 1989).

4.9. Data Analysis

This study attempts to explain differential levels of production and sustainability of fish farm cooperatives by 21 structural variables believed to affect their performance. The expression can be illustrated by the following two equations:

$$1. \quad Y_p = a_p + b_{p1} X_1 + b_{p2} X_2 + \dots + b_{p21} X_{21}$$

$$2. \quad Y_s = a_s + b_{s1} X_1 + b_{s2} X_2 + \dots + b_{s21} X_{21}$$

Y_p : represent production figures

Y_s : represent sustainability levels

a_p : intercept for the first equation

a_s : intercept for the second equation

$b_{p1}, b_{p2}, \dots, b_{p21}$: slope coefficients for the first equation

$b_{s1}, b_{s2}, \dots, b_{s21}$: slope coefficients for the second equation

X_1, X_2, \dots, X_{21} : are the 21 explicative variables hypothesized to be responsible for the differences in levels of production and sustainability.

Multivariate methods are appropriate for such kind of study to allow weighing several factors and their interactions with respect to some outcome. Multiple regression was particularly used to weigh the relative importance of each of the independent variables in counting for variations in the dependent variable.

Production and sustainability were respectively regressed on the 21 explicative variables. The next chapter discusses findings and their implications.

Prior to the regression analysis, steps were made to detect probable existence of high multicollinearity among the explanatory variables. Indeed, if the independent variables are highly correlated, it would be impossible to disentangle their separate effects, and regression coefficients cannot be relied upon because they become fluctuated in presence of high collinearity among the independent variables (Berry and Feldman, 1985; Gordon, 1968; Pedhazur, 1982). The test of multicollinearity included an examination of the matrix of bivariate correlations among independent variables, and a regression of each independent variable on each of the others (Berry and Feldman, 1985; Lewis-Beck, 1980). The matrix of correlations among independent variables is shown in Table 11 of the Appendix.

Members in group and males in group have the largest correlation of ($r=.5669$). The next largest was ($r=.5133$) between members in group and females in group. None of those correlation coefficients was close to .80 to indicate that there might be high multicollinearity. Also, regression tests of each independent variable on each of the others gave the

largest R^2 of 0.629. This R^2 was far from unity. Thus, it was concluded that multicollinearity was not a major problem (Berry and Feldman, 1985; Lewis-Beck, 1980).

Chapter 5

FINDINGS, AND DISCUSSION

This chapter presents results of the regression analysis and their implications. It is divided into five sections. The first section highlights the findings when production is regressed on the independent variables. In the second section, findings when sustainability is regressed on the explanatory variables, are outlined. In the third section, attributes of performing cooperatives are presented, based on findings discussed in the previous sections. The fourth section discusses the implications of this study's findings for development. In the fifth and final section, the limitations of this study are presented.

In presenting the regression coefficients, the focus will be on the BETA's, the standardized coefficients, since they are expressed in standard scores, they make cross-variable comparisons possible. Their relative magnitudes can indicate the relative importance of the independent variables they are associated with in explaining the relative change in the dependent variable (Pedhazur, 1982). The author is less concerned about using the B's, the unstandardized coefficients, which provide indications on how much change occurs in a dependent variable due to a unit change in an independent variable. Indeed, in measuring some variables, efforts were made to secure a sense of "ordinal"

property to the measure, while it is not necessarily obvious to define the amount of one unit change in the measure, or determine the amount of difference between different categories on the measure (Pedhazur, 1982). Those variable measures include, for example, sustainability, leadership, job rotation, and many others. Their measure was associated with questions for which the respondent had to respond by one of the following: 1) strongly disagree, disagree, agree, strongly agree; 2) never, rarely, sometimes, often, always; and 3) once a week, one a month, once a term, once a semester, once a year. Order or rank in those measures are only implicit and conventionally understood in sequence, from low to high categories of the measure. It is actually enigmatic to determine the amount of increment from one level to a higher level in distinguishable terms. In this particular study, the B's would be very difficult to interpret.

5.1. Explaining Production Changes

5.1.1. Regression findings

Table 12 of the Appendix illustrates the results of the regression analysis for production. The independent variables account for 41% ($R^2=.412$) of the variance in production levels. Findings from the regression analysis involving the seven categories of variables are presented in sequence.

Membership Characteristics

Among the variables constituting the membership characteristics, only the total number of members, the number of middle-age members, and the extent of friendship among members have significant coefficients. Their respective Beta coefficients are .098, .170, and .127. The findings confirm the three hypotheses that the number of members, the number of middle-age members, and the extent to which group members are personal friends, have a positive impact on production changes.

None of the other categories of membership has a significant coefficient. Those are the number of male members, the number of female members, the number of young members, the number of old members, the number of single members, the number of married members, the number of widowed members, the number of divorced members, and the extent to which group members have family relationships. Contrary to expectation, no significant relationship is found between those variables and production changes.

Leadership Style

Leadership style has a significant coefficient. Its Beta coefficient is $-.312$, the second largest in absolute terms among statistically significant coefficients.

It was previously explained that leadership was constructed based on a set of questions intended to discover

to what extent group leaders are involved in major decisions regarding collective activities. To those questions, the respondent had to reply by either never, rarely, sometimes, often, or always. A "never" response was indicative of a situation whereby group leaders never make decisions by themselves, without involving other members, indicating a highly democratic leadership style. In contrast, an "always" reply reflects a highly authoritarian leadership style where group leaders are the ones who always make important decisions. In that context, a negative sign of the regression coefficient associated with the leadership measure indicates that it negatively affects production figures, implying that the higher the degree of authoritarianism in group decision-making, the less productive it becomes. The findings confirm the initial hypothesis that a democratic leadership style positively affects production changes.

Cooperative Education

Two measures of cooperative education were hypothesized to be associated with changes in production levels: the frequency of the visits of the cooperative organizer to fish farming groups, and the number of members who received cooperative education and training at the IWACU center. Neither one has a significant coefficient, suggesting that their hypothesized relationship with production changes is not found.

Cooperative Experience

The number of years fish farmers have been together doing fish farming business has a significant coefficient. Its Beta coefficient, .392, is the largest among all statistically significant coefficients. As expected, the findings suggest that the length of time fish farming groups have been together accounts for some variance in production level changes. Indeed, the findings also indicate that the length of time fish farming groups have been together accounts for the greatest amount of change in production.

However, the hypothesis that the number of activities group members collectively engage in has a positive influence on production was not confirmed by the findings. Its coefficient is not significant.

Self-Reevaluation

Contrary to expectation, the frequency of annual general assembly meetings was found not to affect changes in production. The coefficient associated with it was not significant. However, the frequency of reports by the control and supervision board had a significant Beta coefficient of .180. It is the fourth largest among all significant coefficients. This confirms the initial hypothesis that the frequency of reports by the control and supervision board positively affects changes in production.

Knowledge Sharing

A significant coefficient of .231 was found for the extent to which members do all pond management activities on a rotational basis. The hypothesized existence of a relationship between job rotation and production changes is confirmed. The coefficient is the third largest among all significant coefficients.

Equal Treatment

The measure used to indicate equal treatment has a significant coefficient of .092. Thus, a significant relationship was found between production changes and the extent of compliance with arrangements intended to offset failure to provide labor contributions.

5.1.2. Discussion

Eight variables under six categories are found to influence production changes. They include three of the variables that constitute membership characteristics, namely, the number of members, the number of middle-age members, and degree of friendliness among members; leadership style; one of cooperative experience, the number of years group members have been together doing fish farming; one of self-reevaluation, the frequency of reports by the control and supervision board; and the extent to which group members rotate in doing all pond management activities.

An inspection of the magnitude of their Beta coefficients gives some idea about their relative importance in effecting production changes. In order of magnitude, they can be ranked as follows: 1) the number of years of collective fish farming (regression coefficient is .392, $p \leq .001$); 2) leadership style (regression coefficient is -.312, $p \leq .01$); 3) the extent to which each member does all activities on a rotational basis (regression coefficient is .231, $p < .01$); 4) the frequency of reports by the control and supervision board (regression coefficient is .180, $p < .01$); 5) the number of middle-age members (regression coefficient is .170, $p < .01$); 6) the extent of friendliness (regression coefficient is .127, $p < .01$); 7) the number of total group members (regression coefficient is .098, $p < .05$); and 8) the extent to which groups implement arrangements used to compensate for failure to provide labor contributions (regression coefficient is .092, $p < .05$).

Groups that have existed longer were found to be more productive. There are two structural aspects which evolve side by side with the duration of group farming.

On one side, the time fish farmers have been together as a group implies a higher level of mastery of fish production techniques. That expertise is founded on accumulated fish farming experience, following work routines. On the other

side, time is an important dimension in the construction of social reality and identity formation (Zaleznik and Moment, 1964; Berger, 1976). Time allows sufficient daily routines to take place, making cooperative members realize the extent to which they share a common fate. Subsequently, time gives sense of identity to farmers. The latter need time to socialize themselves to group goals and see their sense of membership in collective enterprise enhanced. Acquaintances and familiarities take time to solidify. Group identity enhances commitment to the collective good, especially in social dilemmas when individual interests compete with group interests (Rabbie, 1991). Rabbie (1991) suggests that group identity is beneficial because: 1) it generates stronger pressures to conform to cooperative norms; 2) it induces members to trust their peers, and find them honest; 3) it makes non-cooperators more susceptible to fearing negative sanctions from colleagues; 4) it makes individual interests appear less obvious in relation to group interests; and 5) it makes individual contributions more perceptible by other members.

Furthermore, it is suggested that, in older groups, personal interactions have had enough time to mature into strong friendship ties. It can be suggested that after a while, cooperatives become, for their members, support groups in which members can find emotional, social, and economic

assistance (Allan, 1979). Identity, support, and friendship ties are important in strengthening group cohesion and commitment to the collective interest. These two structural aspects shape how group members fulfill their pond management duties to enhance fish production.

Democratic groups were found to be more productive. A democratic leadership style induces greater involvement of group members in decision-making and in the actual implementation of pond management operations. It enhances popular participation which constitutes an essential element in rural development. It shapes members' responsibility for the provision of fish production inputs (Beal et al., 1956). Production is expected to increase when the fish are fed regularly, and when every body's efforts are deployed to the management of ponds.

Groups with high levels of job rotation are more productive. Job rotation acts against detaining and holding information, which is a sure avenue leading to organizational power (Blau, 1964; Weber, 1978; Wrong, 1979). Fish farm cooperatives are peculiarly self-managed work groups. Cooperative orientations and egalitarian relationships are important aspects of self-management institutions. This is in sharp contrast with competitive values and superior-inferior relationships encountered in traditional formal

organizations. Organizational theorists, including Blau and Scott (1962) and Perrow (1986), indicate that formal organizations foster horizontal redistribution of responsibilities, departmentalized division of labor, and monopolization of skills by some individuals among organizational members.

Yet, Krause (1982) and Rothschild and Whitt (1986) argue that the three features of organizations would be counter-productive in self-managed environments because: 1) they can impede economic interests and ownership patterns; 2) they can threaten political power arrangements; and 3) they can challenge prevailing social values and norms. Expert knowledge can threaten the internal harmony in groups, because it means differential access to some power base in favor of some members at the expense of others. Job rotation is a way to equally redistribute power among group members, creating favorable conditions for cooperative relationships. This idea was echoed by Hackman and Oldham (1980) when they emphasized that knowledge sharing is one of healthy interpersonal processes in work groups. Job rotation prevents any forms of favoritism, which can undermine some members' motivation towards collective interests.

Cooperatives in which control and supervision boards makes reports frequently produce more. Control and supervision board reports are efficient organizational and

control tools. Attempts to organize for collective action must recognize the separation of individual and collective interests. It was pinpointed that fish farm cooperatives are susceptible to the "free riding" problem whereby a rational group member may enjoy a collective benefit without paying for it.

This is an individual and at the same time a social dilemma because individual interests are confronted with collective claims (Rabbie, 1991). Olson (1965) suggests that in such situations, special control mechanisms are needed to reinforce the commitment of individual members to the common interests. The control and supervision board makes reports to the general assembly. These reports may include observations about failures by some members to fulfill their obligations. They make failure to comply with collective duties less valuable because of social disapproval which may follow. In a sense, control and supervision board reports fulfill an important role as a coercion device available to enforce work discipline, which is needed to insure that all pond management operations are done in the proper way. Moreover, it is suggested that the activation of control and supervision board reports serves the collective welfare. Indeed, Rabbie (1991) noted that such reports make members aware of their responsibility for the short and long-run effects of their actions, and they provide members feedback

that their individual contributions are essential in achieving common objectives. This awareness is believed to enhance members' commitment towards the collective welfare.

More homogeneous cooperatives are more productive. The idea that members' homogeneity induce the group to better performance is confirmed here when homogeneity is based on middle age of members and kinship ties in the group.

People in the same age group to some degree share common aspirations and daily life encounters. This may be particularly true in rural communities in Rwanda, where stratifying elements, such as great disparities in educational attainment levels or access to economic and political resources, exist but on a very small scale. Middle-age farmers comprise men and women whose ages range from the mid-twenties to mid-forties. They are married and share the same responsibility as family providers or care takers. For them, fish farming represents an additional source of food and income supply. The similarity of responsibilities and life situations can bring them closer, enhancing their group cohesion and commitment to the collective ventures.

The same effect can be brought about by the sharing of family/kin relations. The family remains for many the primary source of social and economic support. Physical proximity and interdependence usually increase the possibility of more face to face interactions among same-kin members. The result

is that the family stands as a very important institution of social control, attempting to regulate the activities of its members (Landis, 1956; Allan, 1979). This social control applies in fish farm cooperatives with a large number of members who have family relations. It shapes the cohesion of group members in the interest of the collective action. To recap, both the fact of belonging to the same age group, and to the same family (both nuclear and extended) pressure group members to conform to the collective interests, by complying with pond management duties. In fact, "the group defines life situations", the same way life situations define the group (Landis, 1956).

However, contrary to the expectation that smaller groups are more manageable, and consequently perform better than larger ones, the findings indicate that the more members a group has, the higher is their production. Group size was found to be positively associated with production changes, indicating that production tends to increase as the number of group members grow. According to the hypothesis, production was supposed to decrease as the size of the cooperative increases. The idea was suggested for it was believed that smaller fish farm groups would be more manageable and easier to organize for the collective benefit than larger ones.

Indeed, commenting on the effectiveness of small groups relative to large ones, Olson (1965) indicated that in the

large group, each member's actions are very small in relation to the total. Based on Olson's idea, it was implicitly theorized that a large number of group members make them develop the feeling that their efforts are less valuable and effective in affecting the final collective benefit. It was implied that, in large groups, face-to-face interactions are less intense, fostering anonymity and weakening members' social responsibility and collective solidarity. It appeared that it would be extremely difficult to apply the already inadequate sanctions system in fish farm cooperatives. This is why it was hypothesized that a large number of group members would coincide with declines in fish farm cooperatives' productivity.

Several variables theorized to explain the performance of fish farm cooperatives have not been found to have any statistically significant influence neither on production nor on sustainability. Some explanations for that are statistical. In effect, sample statistics have shown that several variables, including the number of females, old, divorced, and widowed members in groups, and the number of group members who benefitted from cooperative education and training at IWACU center, was so small that there actually is not much variation to be accountable for.

5.1.3. Explaining Changes in Production per Member

Table 13 illustrates the results of the regression analysis for production per member. The independent variables account for 21% ($R^2=.213$) of the variance in production per member. Four variables have significant Beta coefficients. They are the total number of members, the number of middle-age members, the number of years members have been working together in cooperative, and the extent to which members do all pond management activities on a rotational basis. Their respective Beta coefficients are $-.122$, $.101$, $.212$, and $.152$.

Though labor productivity was not the primary subject of this analysis, the regression analysis for production per member reinforces the importance of those four variables in shaping the performance of cooperatives. However, more significantly is the effect of group membership size on labor productivity. A negative Beta coefficient suggests that the more members a cooperative has, the smaller is its production per member. Membership size is found to be negatively associated with productivity.

The law of diminishing marginal returns may be in effect here, suggesting that successive additions of members lead to correspondingly lower increases in fish production. Subsequently, large membership size lead to smaller individual benefits.

5.2. Explaining Sustainability Changes

5.2.1. Regression Results

Regression results for sustainability are reported in Table 14. Only 25.9% ($R^2=.259$) of the variance in sustainability changes is explained by the independent variables in the model.

Membership Characteristics

The number of group members, the number middle-age members and the extent of family ties have significant coefficients, confirming their hypothesized influence on changes in sustainability levels. Their respective Beta's are .110, .134, and .093, which all are significant at $p < 0.05$.

Regression coefficients for the remaining variables of the membership characteristics are not significant. No significant relationship is found between them and sustainability.

Leadership Style

The coefficient is not significant. No relationship is found between the leadership style and changes in sustainability levels.

Cooperative Education

None of the two cooperative education measures has a significant coefficient. Their contribution to sustainability changes is not significant.

Cooperative Experience

Years of collective farming is found to have a positive relationship with sustainability levels. Its coefficient .148 is significant at $p < .05$, and it is the third largest among all significant coefficients. On the contrary, the number of collective activities does not have a significant association with changes in sustainability levels.

Self-Reevaluation

The frequency of general assembly meetings has a Beta coefficient of .190, which is the second largest among all significant coefficients. This confirms the hypothesis that general assembly meetings positively influence changes in sustainability. The other measure of self-reevaluation does not have any significant impact on sustainability.

Knowledge Sharing

The extent to which each member has to participate in all fish production operations on a rotational basis is found to affect sustainability changes. It has the largest coefficient, and thus, it gives the most explanation to changes in sustainability.

Equitable Treatment

The measure of equal treatment does not have any significant relationship with sustainability. The theorized relationship is not supported by the data.

5.2.2. Discussion

Six measures significantly explain changes in sustainability levels. They are the number of group members, the number of middle-age members, the extent of friendliness, the number of years of collective fish farming, the frequency of general assembly meetings, and the extent to which each member does all fish pond operations on a rotational basis. Given the magnitude of their Beta coefficients, they are ranked as follows in importance in explaining sustainability: 1) the extent of job rotation (regression coefficient is .243, $p < .01$); 2) the frequency of general assembly meetings (regression coefficient is .190, $p < .05$); 3) the number of years of collective fish farming (regression is .148, $p < .05$); 4) the number of middle-age members (regression coefficient is .134, $p < .05$) ; 5) the number of group members (regression coefficient is .110, $p < .05$); and 6) the extent of family ties (regression coefficient is .93, $p < .05$).

Farmers in groups in which each member does all pond management operations have greater prospects for sustaining fish farming activities. When group members rotate in their pond and fish care work routines, each one becomes more knowledgeable in fish culture. As a consequence, the whole group becomes more self-sufficient, and has better prospects

for sustainability. Job rotation acts as a redistributive way to diffuse fish culture techniques among group members. It enables each and every one in the group to grasp fish production skills: digging the pond, gathering feeds for the fish, collecting fertilizers to put in the pond, maintaining adequate level of water, cutting the grass around the pond. For group fish farming to be sustainable, every one must know the basic pond management operations.

The findings suggest that meetings have a constructive impact on members' disposition to assimilate and actually adopt the fish farm innovation. General assembly meetings exercise retraining and discipline roles. Indeed, on one hand, these meetings are forums in which members exchange ideas or insights relative to fish pond operations and their organizational needs. On the other hand, meetings are used to point out the failure of delinquent members to comply with duties to the collective enterprise, and to suggest remedies. General assembly meetings serve as a social forum where all group members discuss planning, implementation, and make decisions regarding pond management operations. The frequency of general assembly meetings depicts the level of social participation of group members in deciding the fate of fish culture innovation (Hong, 1981).

The results show that older fish farm groups have better prospects for sustainability than younger ones. This is a

confirmation of the idea that innovations take time to diffuse. As Rogers (1983) notes, time remains an important element in the diffusion and communication processes. Likewise, fish farmers gradually take time to gather the fish culture know-how.

Among the variables constituting membership characteristics, only membership size, middle-age members, and family ties affect sustainability. The findings suggest that larger groups are more sustainable than smaller ones. They also indicate that, as far as homogeneity factors are concerned, the prominence of middle-age and friendship among group members are the only relevant variables to affect groups' ability to self-sustain. This is due to the fact that middle-age people were the most predominant group in fish farm cooperatives. Besides, the fact that middle-age and friendship positively influence sustainability, represents a situation similar to what Rogers (1983) calls a "homophilous" situation, when individuals belong to similar groups, share the same aspirations, and are drawn together by the same interests. It is remarked that "homophilous diffusion patterns cause new ideas to spread horizontally, rather than vertically, within a system (Rogers, 1983)." The role of horizontal spread of ideas, and the influence of friends affect the adoption of innovations, because communication among people who socially are alike is more effective, in

terms of knowledge gain (Rogers, 1983). This suggests that the spread of tilapia production techniques finds a comparable advantage in middle-age members and those who are friends.

5.3. Overview of Findings

To summarize the regression results, the reader will remember that eight variables were found to have a significant influence on production. They include, in order of importance, the number of years of collective of fish farming, democratic leadership style, job rotation, the frequency of reports by the control and supervision board, a high proportion of middle-age members, a high level of family ties, membership size, and the degree of compliance with arrangements intended to compensate for failure to contribute labor. Six variables significantly influence sustainability. In order of importance, they are the extent of job rotation, the frequency of general assembly meetings, the duration of collective fish farming, the number of middle-age members, membership size, and lastly, the extent of friendliness.

Only four variables affect both production and sustainability changes. They include membership size, the number of middle-age people in the group, years of collective fish farming, and job rotation. If the most effective groups have attributes that are conducive to enhanced production and

sustainability, then exemplar fish farm cooperatives have the following characteristics. Firstly, they are those with greater number of members. Secondly, the majority of their members are between 26 and 45 years of age. Thirdly, job rotation is the principal form of work organization in those groups. Finally, they are those that have existed longer.

The performance of fish farm cooperatives is enhanced by frequent general assembly meetings, frequent reports by the control and supervision boards, and a democratic leadership style effective in decision-making. It is also enhanced by friendliness and kinship ties among group members. A summarized illustration of the attributes of performing fish farming groups is provided in Table 15 of Appendix A.

5.4. Implications for Development

Many scholars of development and rural development (Bertrand, 1972; Portes, 1976; Jaffee, 1990) agree that any development program must include at least three components. Firstly, the program must aim at sustaining the increased production of goods and services by improving the productive capacity of local resources. The end result of agricultural development is the expansion of food production, increases in income levels of people, and improvement of the well-being of rural people. Secondly, the program must promote greater involvement of the beneficiaries in the planning and

implementation of the development operations. Thirdly, social justice and equity must be applied in the distribution processes to insure that all social groups enjoy the benefits of economic growth. This section will discuss certain implications of collective fish culture in Rwanda, in the context of the overall objectives of development.

Fish culture activities in Rwanda are a typical example of joint resolution involving the government and international donor partners, to solve the problem of food shortages and rural development (Lea and Chaudhri, 1983). Moreover, fish culture activities illustrate the need for a sound cooperation between the sponsor and the beneficiaries, the project personnel and the farmers, as well as among the beneficiaries themselves. Aquaculture endeavors represent a division of labor whereby the government and the donor partner, the USAID, provide the basic human, material, and financial conditions necessary for the initiation and maintenance of fish pond farming, while the farmers offer their time, efforts, inputs, and managerial dispositions to the development enterprise.

Fish culture development in Rwanda fulfills the economic allocation of local resources in development efforts (Uphoff, 1985). Fish, valley land, local agricultural and animal resources like vegetables and manure, and manpower are exploited and used in a productive activity which offers

employment opportunities, insure income flows, and enhances the nutritional status of beneficiaries. Many families depend on fish culture to improve their diet and to satisfy their basic economic and social needs. A precise account of the importance of fish farming as a source of income, both in relative and absolute terms, needs to be further explored. There are even reasons to believe that the contribution of fish commodities in individual families' income, is not very substantial. Indeed, harvests remain relatively limited, the number of group members is large in some cooperatives, and there are unfavorable market conditions for a highly perishable item like fish. Yet, as small as that contribution may be, it remains highly significant in communities deprived of basic economic resources.

Cooperative farming as implemented in the majority of fish pond operations initiates and promotes self-help elements on the part of small farmers in development (Chambers, 1984). Farmers carry the responsibility for the provision of resources/inputs necessary for pond management. They have the authority to determine resources use, and to decide the disposition of the output. Collective fish farming generates popular support and interest of small farmers about decisions and actual conduct of the development project components. This grassroots participation empowers farmers to

become responsible for their own advancement (Lacroix, 1985; Oakley and Mardsen, 1984).

Group fish farming has a redistribution mandate. It insures that a large portion of the population of the rural community population has genuine access to development benefits. The strategy reduces the impact of power/conflict competition and relationships in rural communities which are likely to harm the interests of the less advantaged social groups (Ramos and Fletcher, 1983; Oakley and Marsden, 1984). Cooperative principles are useful tools for the protection of peasants, by providing them some institutionalized decisional power. Without that power small farmers are likely to find themselves excluded from productive activities. Farmers can use power to manipulate organizational tools, such as the incentive and sanction systems, in order to achieve enhanced productivity and fairer redistribution of development benefits.

Collective fish farming offers credence for the possibility of institutional change and the role of technological innovations in rural development. Tilapia has been enthusiastically received in Rwandan rural communities because of its economic and nutritional value, and because of its relative adaptability to the Rwandan social and physical

environment. Cooperatives represent one intermediary organizational device to carry the tilapia innovation to farmers.

However, some failures of fish farming schemes in Rwanda can be reported. A question can be asked to determine who are the real beneficiaries of aquaculture development operations. Sample statistics have shown that women were excluded not only from the technology, but also from productive tasks, and from the cash economy centered around tilapia production. Indeed, it was observed that female membership in groups was extremely small when compared to its male counterpart. During the field work, the researcher realized that there was only one all-female fish farm cooperative. Made up of seven members, this cooperative was initiated by two women school-teachers. One of the two women was the wife of a local administrative authority. Because of their official duties, the two women remained members of the group, but they were never involved in daily decision-making or fish pond management operations.

Most female group members belonged to mixed groups. Like their male colleagues, female members were young unmarried women, who had just come out of the primary school, and were looking for any productive activity which could insure some financial independence. They were very active in collective activities. However, when they got married, they had to

renounce their group activities, in order to concentrate their time and efforts to their new family duties. Another category of female group members were widows who became fish farmers to succeed and replace their deceased husbands.

A high social status in the local community, an involvement in male associations, and widowhood seem to be the conditions for women to benefit from aquaculture development. This suggests that women face a double disadvantage, in aquaculture development efforts, both as members of the rural population, and by reason of a social structure that assigns particular roles to them. Indeed, despite their numeric superiority and their productive potential, women remain a powerless group, excluded from the decision-making in productive activities in many developing countries (Panuccio, 1989). Moreover, by reason of their gender, women have to give up their productive and income-generating activities when they change from unmarried to married status. Yet, it was pointed out that, besides its economic importance, fish culture was promoted primarily for its dietetic value, as a rich source of proteins.

Women are usually the ones engaged in food preparation at the household level. For this reason, it appears appropriate to include them in fish production decisions, at least in those regarding the disposal of fish either as a cash income or as a food item. Furthermore, egalitarian

concerns, combined with family and friendliness considerations, can prevail at the expense of efficiency in the diffusion of new innovations.

In collective action, slowness in the adoption of innovation must be tolerated so as to allow everybody to proceed at their own pace. Besides, a few cases were reported to the researcher when group members, who failed to report to the pond to feed the fish, could not be fined because most members in the group were their relatives and friends. One group leader declared that fining the delinquent member was in fact fining the whole group. In that group, a member who failed to contribute his daily obligations, had to give to the group 80 local francs, equivalent to the official pay for one-day manual work. What the group leader meant is that, to collect the 80 francs, the delinquent member would have to borrow it from his friends or relatives, who were the group members. The leader insisted that it would be very difficult to repudiate such a request by a friend or close relative. In the end, fining the delinquent member was penalizing the group because it is the group members who actually would have to provide the 80 francs. The example shows how close relations can be detrimental to the efficiency objectives of any productive development activity.

Furthermore, large cooperatives can be self-destructive. Findings of this study suggest that membership size

correspond to lower individual benefits, which in the long-run, may lead members to quit the enterprise. Even if group fish farming serves to redistribute the land resource to a large portion of the people, efforts are needed to create conditions that are conducive to higher productivity, both in short and long terms. One such condition is limiting membership size to the optimal number of members a group can have.

5.5. Limitations of the Study

Several of the shortcomings of this study are presented in this section. Some are methodological, while others are a direct consequence of the peculiar features of the sample at hand and the overall population of fish farmers in Rwanda.

Indeed, it was previously observed that this study has not made the analysis of the changes in organizational performance in relation to the gender of cooperatives' members possible. Female group members were found to be so few that any attempt to make comparisons between men and women in fish farm cooperatives would be meaningless. It was pointed out that this was due to the fact that women are under-represented in the 200 sample groups. More significantly, women are under-represented in fish farming activities in the whole country (Molnar et al., 1990). Therefore, the findings of this study and subsequent

conclusions apply better to men group members. However, wider women involvement in fish farming would be an interesting aspect to look at to investigate how an additional productive activity interacts with women's already heavy charge of family duties (Molnar et al., 1990).

The statistical interpretations of this study relied on the standardized regression coefficients (the Beta's) in order to make cross-comparisons between the independent variables, based on the relative weight of each in explaining the variance in the dependent variable. However, Pedhazur (1982:247) observes that standardized coefficients are sample-specific and unstable to be used to appropriately generalize on populations. Therefore, generalizations of the findings of this study to the activities of fish farming cooperatives in the country should be attempted with great caution.

Implicit in this study are assumptions that external factors, especially the extension service and local administrative authorities, similarly affect organizational patterns across fish farm cooperatives. It is appropriate, however, to point out that the impact of those external actors depends on the nature, quality, and intensity of their interactions with group members. Such interactions can be shaped by personal qualities of group leaders and group members themselves. Subsequently, the quality and intensity

of interactions between fish farm cooperatives and external actors may differ according to the characteristics of group members. This is why the fact that this study does not seek to analyze cooperative organizational patterns, based on the interactions between group members and external actors, can be seen as a shortcoming.

Future research is needed to analyze the impact of external factors on organizational performance of fish farm cooperatives. Such research should focus on the role of extension agents and local officials of the government in relation to organizational performance of fish farm cooperatives. Also, future research is needed to test the relationship hypothesized to exist between organizational performance of fish farm cooperatives, on the one hand, and the ethnic composition of group members and their access to political and economic resources, on the other.

In addition, further research is needed to indicate the optimal number of members cooperatives can have. Cooperatives would then be encouraged not to exceed that number in order to safeguard higher levels of productivity for the enterprise.

Chapter 6

SUMMARY AND RECOMMENDATIONS

6.1. Summary

Agricultural cooperatives are formal organizations of farmers who pool their resources together and opt for collective managerial procedures, and models of social interaction in their efforts to enhance their economic and social position. Agricultural cooperatives hold a unique place in the rural economy of Rwanda since they permeate almost all spheres of agricultural production. In every case, they prevail in the fish farming sector, which remains dominated by cooperative pond holdings. The popularity of group fish farming can be attributed to its potential not only to facilitate widespread dissemination of land resources and fish production technologies to a larger number of farmers, but also to integrate limited individual human and material assets into sizable and economically viable production units, and to give small farmers the possibility to control fish supplies in order to enhance their bargaining power at the fish market.

Producing pond fish in cooperatives requires a sizable amount of labor arrangements to deploy the human and material resources needed to dig ponds, collect feeds for fish nutrition, collect organic matter to facilitate the reproduction of plankton used to feed fish, maintain adequate

quality and level of water in ponds, harvest, and dispose of the produce. Thus, the effectiveness of the whole strategy to transfer fish production technologies in Rwanda depends on the standing of fish farmer cooperatives, which in turn, is a function of the smooth operation of those cooperatives. Indeed, it is through efficient managerial practices, and through concerted organizational arrangements which shape group cohesion and solidarity that farmers can collectively enhance their fish production and assimilate the fish farming know-how.

Yet, the efficiency of group fish farming can be undermined by organizational dilemmas stemming from the internal structure of cooperatives. The lack of professional management leaves group farmers with limited administrative capacity, given their low levels of education. Egalitarian and democratic doctrine deprives groups of any central authority that can facilitate the direction and coordination of activities. Equal sharing of benefits restrains groups from applying selective incentive and sanction systems to reward exceptional individual efforts, while maintaining compliance with collective obligations. If, despite apparent shortcomings, farmers continue to venture into collective fish production undertakings, then groups must have devised dynamic self-governance systems for formulating and enforcing collective rules and work organization.

The object of this study was to investigate the organizational characteristics and procedures which shape social relations of production, and conditions that are conducive to the relative effectiveness of fish farmer cooperatives in Rwanda. On the one hand, this study was founded on the premise that well planned cooperative endeavors can fulfill economic and social needs of farmers, while, on the other, it was believed that efficient organization is a social and technical issue that can influence the performance of fish farm activities. But lack of efficient organization can be a sure factor for the failure of fish farming cooperatives.

The research approach followed two major steps. In the first, as guides to the study, a theoretical model and research hypotheses were developed, based on theoretical and empirical accounts found in the literature on cooperatives. Social exchange and organizational perspectives were used to explain organizational processes in cooperative associations. It was observed that balanced reciprocity is a very important dynamic element required for the sustenance of exchange relationships that bring members of cooperatives together. The fundamental principle is that benefits must be proportional to individual contributions. Also, several considerations were made in connection with organizational needs. It was remarked that theoretical accounts and

empirical evidence indicate that cooperatives operate better when collective control and substantive participation of members in decision-making are implemented to insure trust through mutual control, stimulate individual commitment to collective enterprise and group cohesiveness, and to establish equity in the administration of costs and benefits. Besides, horizontal communication channels and resource development schemes have to be secured, geared toward enhancing decision-making and communication skills of members.

The model was based on seven categories of variables or concepts which were identified as the core structural elements important in the organization of fish farmer groups. Those elements include membership characteristics, including membership size, gender, marital status, age group, family/kin ties, and friendship ties; the leadership style; cooperative education; cooperative experience; self-reevaluation schemes; methods of fish farming knowledge sharing; and efforts to maintain equity in the sharing of contributions and benefits. Directly derived from the core variables, specific research hypotheses were developed to allow the testing of the theorized relationship that exists between each core variable and each one of the two developmental objectives of the strategy to introduce fish farming activities in Rwanda: enhanced fish production and fish farming sustainability.

The hypotheses were tested with data for 200 fish farmer cooperatives, sampled in the two southern Rwandan districts: Butare and Gikongoro.

Information related to groups' production was gathered from the RFCP archives. Other information on each of the 200 sampled groups was obtained from three of its representatives who, by virtue of their position and duties in the group, had factual knowledge about their groups. Group representatives provided information about individual characteristics of their peers, how major decisions were made, how cooperative education and training was organized, how work organization was done, and what arrangements were made to establish equity among members, and about the nature of internal control mechanisms.

The statistical analysis used regression tests whereby production and sustainability were regressed on the independent variables. Results indicated that structural characteristics have a positive influence on the performance of fish farmer groups. Production was found to be positively affected by: 1) the number of cooperative members; 2) the number of middle-age members (26-45 years old); 3) the degree of family ties; 4) the democratic leadership whereby all members participate in major decisions regarding group activities; 5) the number of years group members have been together doing collective fish farming; 6) the frequency of

reports made by the control and supervision boards and submitted to the general assembly; 7) the extent to which each member does all pond management operations, on a rotational basis; and 8) the extent to which groups make efforts to make members who fail to provide their labor contribution compensate by either paying a monetary fine, or by being replaced by a family member.

Sustainability was found to be positively associated with: 1) the number of group members; 2) the number of members 26-45 years old; 3) the extent of friendship ties in the group; 4) the number of years of collective fish farming; 5) the frequency of general assembly meetings; and 6) the extent to which all members do all pond management operations, on a rotational basis.

6.2. Recommendations

On the basis of success factors identified in fish farmer groups, several recommendation are made, which are intended to point out where purposive action can be taken to improve the organizational effectiveness of cooperative fish farmers:

1. Cooperatives should be encouraged to invigorate their reevaluation mechanisms. General Assembly meetings should be held regularly, and Control and Supervision Boards should be mandated to regularly submit their reports to general assemblies. General assembly

meetings and control and supervision board reports shape democratic leadership traits and processes which affect group productivity and sustainability.

2. Cooperatives should be encouraged to implement job rotation policies whereby all group members alternate shifts on pond management operations. Job rotation is the basis for the dissemination of fish farming skills which farmers put to use to enhance their production output. Additionally, it contributes to the prevention of internal conflicts among members that might occur because of differential access to fish production information.
3. Efforts should be intensified to educate fish farmers in cooperative education. To do that, institutions of cooperative education should be made more responsive to educational needs of fish farmers. Farmers indicated that groups most visited by the communal cooperative organizers were those well established agricultural production groups, especially those involved in growing vegetables. Fish farming groups received less attention because fish culture is a relatively new activity. Moreover, very few fish farmers were trained at the IWACU center. This may be explained by the fact that IWACU primarily provides managerial and organizational training to commercial rural cooperatives. These cooperatives produce or market large quantities of

agricultural products. Fish farm groups are at a disadvantage because, on one side, their production remain relatively too small to be marketed on a very large commercial scale, and on the other side, a large portion of their fish production is used for households self-subsistence. Both the communal cooperative organizers and the IWACU center should be made more aware of the need and obligation to include fish farmer cooperatives among their target groups. Another way to insure adequate cooperative education and organization to fish farmers may be to design additional functions to fish culture extension agents. Farmers indicated that their fish culture extension agent was the only public officer they regularly interacted with. Fish culture extension specialists command tremendous respect from fish farmers both as government officials and as fish production experts. Some extension agents indicated that they often found themselves involved in situations whereby they had to settle disputes over how to divide the harvest, or market fish. Others indicated that they were the first authorities contacted by group leaders when some members in the group had failed to provide their daily contributions to the cooperative. Advising groups in organizational matters was beyond the jurisdictional duties and expert knowledge of fish culture

extension agents. However, if trained in cooperative organization and education, and given the authority, fish culture extension specialists can be resourceful people who could do a better job of training and organizing fish farmers in cooperatives.

4. Efforts should be made to invigorate the same success factors in other types of small-scale agricultural production cooperatives. Indeed, similar success factors are expected to produce similar effects on the performance of cooperatives with the same organizational needs. An example of cooperatives to which this study's findings may apply are those engaged in the production of vegetables. Like their fish farming counterparts, they are primarily geared towards small-scale and subsistence households production. The basic inputs requirements may be different. But, to enhance productivity, they all need organizational and structural conditions that are conducive to group cohesion, solidarity, and members' commitment to the collective enterprise.
5. Since how long groups have existed is found to be a factor related to their performance, fish farming extension and cooperative training efforts should concentrated on newly created groups. At the same time, the old groups should not be neglected. Otherwise, they might decline through complacency.

Furthermore, no matter how low the level of performance of young groups, they must still be given the necessary morale booster and encouragements to enable them to feel confident and stay in business, and accumulate experience which will enable them to become more productive.

6. Because the number of cooperative members tend to lead to lower production per member, efforts are needed to find out the optimal membership size. Optimal membership size is an important structural feature that, in the short and long run, can guarantee adequate levels of productivity for fish farm cooperatives.

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APPENDIX A

TABLES

Table 1. Number of sample fish farm groups in communes:

<u>Communes</u>	<u>Number of cooperatives in communes</u>	<u>Sample cooperatives in communes</u>	<u>Percentage of sampled cooperatives in communes</u>
Kigembe	36	18	50
Gishamvu	16	7	44
Nyaruhengeri	19	10	53
Muganza	113	26	23
Kibayi	32	17	53
Runyinya	29	14	48
Maraba	15	5	33
Mbazi	22	9	41
Ruhashya	10	4	40
Shyanda	25	13	52
Huye	7	4	57
Ngoma	22	9	41
Rusatira	17	2	12
Muyira	42	26	62
Ntyazo	39	23	59
Kinyamakara	15	8	53
Nyamagabe	13	5	38
TOTAL	472	200	

Table 2. Distribution of sampled cooperatives by the gender composition of members.

<u>Gender</u>	<u>Number</u>	<u>Percentage</u>
All Male	102	51
All Female	2	1
Mixed	96	48
TOTAL	200	100

Table 3. Distribution of Respondents by Gender and Functions:

	President	Vice-President	Secretary	Treasurer	TOTAL
Male	198	99	170	55	522
Female	2	14	21	41	78
TOTAL	200	113	191	96	600

Table 4. Variances of Observations in Groups for Self-Sufficiency Items:

Every member of your cooperative knows the appropriate feed for fish.

<u>Variances</u>	<u>Frequency</u>
0.00	156
0.47	31
0.80	9
1.25	4

Every member of your cooperative knows the appropriate fertilizers to put in the pond.

<u>Variances</u>	<u>Frequency</u>
0.00	162
0.47	25
0.80	13

Every member of your cooperative can estimate the adequate level of water in ponds.

<u>Variances</u>	<u>Frequency</u>
0.00	158
0.47	46
1.25	6

Every member of your cooperative can tell when the fish is mature enough to be harvested.

<u>Variances</u>	<u>Frequency</u>
0.00	161
0.47	17
0.80	18
1.25	4

Every member of your cooperative knows enough about fish farming in such a way he (she) can do without the extension assistance.

<u>Variances</u>	<u>Frequency</u>
0.00	182
0.47	15
0.80	3

Every member of your cooperative can produce and maintain the seed-stock.

<u>Variances</u>	<u>Frequency</u>
0.00	152
0.47	31
0.80	9
1.25	8

Table 5. Variances of Observations within Groups for Leadership Items:

Only group leaders decide on the date a group member reports to the pond.

<u>Variances</u>	<u>Frequency</u>
0.00	173
0.47	21
0.82	5
1.63	1

Only group leaders decide on who does which operation.

<u>Variances</u>	<u>Frequency</u>
0.00	164
0.47	28
0.82	5
0.94	3

Only group leaders decide on the date to harvest.

<u>Variances</u>	<u>Frequency</u>
0.00	191
0.47	8
0.82	1

Table 6. Variances of Observations within groups for the Cooperative Education Item:

How often does the cooperative organizer visit your cooperative?

<u>Variances</u>	<u>Frequency</u>
0.00	138
0.82	29
1.12	24
1.25	9

Table 7. Variances of Observations within Groups for the General Assembly Meetings Item:

How often does the General Assembly hold meetings?

<u>Variances</u>	<u>Frequency</u>
0.00	183
0.47	16
0.82	1

Table 8. Variances of Observations within Groups for the Control and Supervision Board Reports Item:

How often does the Control and Supervision Board submit reports to the genral assembly?

<u>Variances</u>	<u>Frefuence</u>
0.00	182
0.82	15
1.63	3

Table 9. Variances of Observations within Groups for the Rotational Work Item:

Every member in your group does all operations at different times, on a rotational basis.

<u>Variances</u>	<u>Frefuence</u>
0.00	178
0.47	17
0.94	5

Table 10. Sample Statistics

<u>Variables</u>	<u>Min.</u>	<u>Max.</u>	<u>Mean</u>	<u>Med.</u>	<u>Mode</u>	<u>M.F.</u>	<u>Skew.</u>	<u>Kurt.</u>
Yp	22	159	36	72	46	11	.438	-.028
Ys	12	24	20.4	21	20	11	-1.029	.453
X1	3	57	12.4	10	12	23	2.299	5.882
X2	0	46	8.7	7	5	24	2.174	6.678
X3	0	18	3.6	2	0	91	4.304	24.163
X4	0	25	4.9	2.5	0	68	3.419	17.109
X5	0	40	5.9	4	0	57	2.281	6.501
X6	0	32	1.7	0	0	119	4.609	29.965
X7	0	57	4.9	2	0	66	3.365	16.898
X8	0	48	7.2	5	0	55	2.263	6.533
X9	0	5	.1	0	0	154	5.618	37.993
X10	0	8	.1	0	0	184	9.302	88.906
X11	1	5	4.1	4	5	71	-.883	.112
X12	1	4	2.3	2	2	103	.357	-.097
X13	3	15	8.3	8	3	54	.186	-1.425
X14	1	6	2.3	2	1	68	.968	.045
X15	0	8	.1	0	0	188	6.321	76.924
X16	1	5	2.8	2	2	35	.892	-.578
X17	1	22	7.3	5	4	31	1.151	.332
X18	1	5	3.6	4	4	107	-.821	.494
X19	1	5	3.4	4	5	89	-.361	-1.555
X20	1	5	4.6	5	5	137	-2.305	5.820
X21	1	5	3.9	4	5	91	-.862	-.551

N=200

Table 11. Spearman Zero-Order Correlation Coefficients
between variables.

	Yp	Ys	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21
Yp	.00																						
Ys	.22	.00																					
X1	.31	.35	.00																				
X2	.18	.00	.56	.00																			
X3	.28	.12	.51	.08	.00																		
X4	.11	.13	.13	.28	.02	.00																	
X5	.36	.42	.19	.25	.34	.26	.00																
X6	.00	.04	.36	.27	.13	.42	.37	.00															
X7	.15	.10	.41	.31	.16	.45	.42	.29	.00														
X8	.17	.23	.41	.34	.28	.32	.40	.43	.44	.00													
X9	.05	.13	.31	.19	.28	.22	.41	.42	.17	.39	.00												
X10	.03	.00	.02	.03	.12	.01	.11	.11	.03	.08	.26	.00											
X11	.26	.29	.07	.10	.09	.11	.04	.21	.00	.15	.31	.12	.00										
X12	.19	.25	.05	.14	.09	.01	.02	.05	.01	.09	.04	.32	.50	.00									
X13	.42	.09	.21	.23	.00	.05	.32	.22	.34	.00	.03	.08	.23	.07	.00								
X14	.43	.23	.08	.10	.07	.21	.07	.00	.00	.12	.04	.09	.10	.31	.11	.00							
X15	.00	.00	.05	.04	.09	.12	.10	.03	.17	.21	.31	.09	.00	.15	.08	.21	.00						
X16	.34	.27	.03	.24	.07	.16	.21	.05	.00	.31	.41	.08	.16	.04	.11	.02	.13	.00					
X17	.07	.21	.09	.34	.01	.04	.00	.13	.08	.15	.31	.00	.06	.10	.00	.00	.02	.09	.00				
X18	.11	.40	.08	.04	.00	.00	.13	.09	.08	.01	.00	.03	.10	.09	.15	.13	.09	.21	.04	.00			
X19	.42	.10	.03	.12	.19	.02	.34	.21	.07	.30	.22	.00	.13	.40	.21	.01	.09	.14	.31	.21	.00		
X20	.27	.39	.12	.08	.00	.00	.05	.14	.01	.43	.32	.17	.00	.08	.23	.33	.21	.15	.09	.09	.11	.00	
X21	.32	.07	.09	.11	.08	.00	.00	.03	.10	.06	.02	.10	.09	.12	.06	.02	.00	.12	.02	.13	.04	.10	.00

N=200

Table 12. Regression results when production is regressed on the independent variables.

Independent Variables	B	BETA
X1: Number of members in group	.233	.098*
X2: Number of male members	.061	.034
X3: Number of female members	.025	.012
X4: Number of young members	.034	.008
X5: Number of middle-age members	.193	.170**
X6: Number of old members	.043	.005
X7: Number of single members	.121	.073
X8: Number of married members	.135	.077
X9: Number of widowed members	.094	.031
X10: Number of divorced members	.082	.012
X11: Extent of friendship ties	.110	.067
X12: Extent of family ties	.139	.127*
X13: Leadership style	-.432	-.312**
X14: Frequency of visits by cooperative organizer	.105	.032
X15: IWACU visits	-.006	-.001
X16: Years as fish farm cooperative	.460	.392***
X17: Number of shared collective activities	.067	.017
X18: Frequency of general assembly meetings	.081	.055
X19: Frequency of control and supervision board reports	.213	.180**
X20: Job rotation	.265	.231**
X21: Extent of compliance with compensation measures	.137	.092*
R ²	.412	
R ² (Adjusted)	.293	

N=200

* Significant at $p < 0.05$

** Significant at $p < 0.01$

*** Significant at $p < 0.001$

Table 13. Regression results when production per member is regressed on the independent variables.

Independent Variables	B	BETA
X1: Number of members in group	-.144	-.122*
X2: Number of male members	-.056	-.031
X3: Number of female members	.078	.052
X4: Number of young members	.008	.000
X5: Number of middle-age members	.108	.101*
X6: Number of old members	.009	.002
X7: Number of single members	.113	.076
X8: Number of married members	.121	.065
X9: Number of widowed members	.085	.010
X10: Number of divorced members	.102	.045
X11: Extent of friendship ties	.003	.000
X12: Extent of family ties	.016	.005
X13: Leadership style	.101	.071
X14: Frequency of visits by cooperative organizer	.009	.001
X15: IWACU visits	.005	.000
X16: Years as fish farm cooperative	.234	.212**
X17: Number of shared collective activities	.076	.037
X18: Frequency of general assembly meetings	.103	.085
X19: Frequency of control and supervision board reports	.099	.071
X20: Job rotation	.194	.152*
X21: Extent of compliance with compensation measures	.100	.064
R^2		.213
R^2 (Adjusted)		.179

N=200

* Significant at $p < 0.05$

** Significant at $p < 0.01$

Table 14. Regression results when sustainability is regressed on the independent variables.

Independent Variables	B	BETA
X1: Number of members in group	.131	.110*
X2: Number of male members	.095	.067
X3: Number female members	.061	.012
X4: Number of young members	.005	.000
X5: Number of middle-age members	.143	.134*
X6: Number of old members	.008	.001
X7: Number of single members	.102	.057
X8: Number of married members	.125	.082
X9: Number of widowed members	.001	.000
X10: Number of divorced members	.003	.000
X11: Extent of friendship ties	.099	.093*
X12: Extent of family ties	.056	.021
X13: Leadership style	.073	.030
X14: Frequency of visits by cooperative organizer	.094	.071
X15: IWACU visits	.017	.009
X16: Years as fish farm cooperative	.210	.148*
X17: Number of shared collective activities	.094	.076
X18: Frequency of general assembly reports	.217	.190*
X19: Frequency of control and supervision board reports	.005	.003
X20: JOB rotation	.263	.243**
X21: Extent of compliance with compensation measures	.011	.004
R ²	.264	
R ² (Adjusted)	.251	

N=200

* Significant at $p < 0.05$

** Significant at $p < 0.01$

Table 15. Summarized Presentation of Regression Results⁴

<u>Independent Variables</u>	<u>Prod.</u>	<u>Sust.</u>
X1: Number of members in group	<u>7</u>	<u>5</u>
X2: Number of male members		
X3: Number of female members		
X4: Number of young members		
X5: Number of middle-age members	<u>5</u>	<u>4</u>
X6: Number of old members		
X7: Number of single members		
X8: Number of married members		
X9: Number of Widowed members		
X10: Number of divorced members		
X11: Extent of friendship ties		6
X12: Extent of family ties	6	
X13: Leadership style	2	
X14: Frequency of visits by cooperative organizer		
X15: IWACU visits		
X16: Years as fish farm cooperative	<u>1</u>	<u>3</u>
X17: Number of shared collective activities		
X18: Frequency of general assembly meetings		2
X19: Frequency of control and supervision board reports	4	
X20: Job rotation	<u>3</u>	<u>1</u>
X21: Extent of compliance with compensation measures	8	

⁴Numbers indicate the rank of the relative magnitude of significant Beta coefficients associated with independent variables. Similarly, numbers indicate the importance of each independent variable that significantly explains production and sustainability changes. Insignificant coefficients are not shown. Underlined numbers correspond to variables found to be simultaneously associated with production and sustainability.

APPENDIX B

QUESTIONNAIRE

Alphonse Rubagumya
Department of Sociology
Louisiana State University
Baton Rouge, LA 70803

COOPERATIVE FISH FARMING STUDY:

Note: This survey is purely for research and academic purposes. The items simply describe the characteristics of your fish farm cooperative. They are not intended to judge whether those attributes are desirable or undesirable. The purpose is to help make an objective description of what your fish farm cooperative is like. There are no right or wrong answers.

Confidentiality will be assured.

Date: _____

I.D. #: _____

General Information:

1. Name of the Respondent: _____
2. Function of the Respondent: _____
3. Name of the Commune: _____
4. Name of the Marais (Valley): _____
5. Name of the Cooperative: _____
6. Name of the Interviewer: _____

Self-Sufficiency in Fish Farming:

Raising fish in ponds requires various operations involving feeding the fish with proper feed, fertilizing the pond with appropriate organic matters, maintaining adequate level of water in ponds, estimating when the fish is mature enough to be harvested.

The following are statements about how much members of your cooperative know about the operations.
Which one best describes your response?

1. Every member of the cooperative knows the appropriate feed for fish.
 1. Strongly disagree
 2. Disagree
 3. Agree
 4. Strongly agree
2. Every member of your cooperative knows the appropriate matters to fertilize the pond.
 1. Strongly disagree
 2. Disagree
 3. Agree
 4. Strongly agree
3. Every member of your cooperative can estimate the adequate level of water in ponds.
 1. Strongly disagree
 2. Disagree
 3. Agree
 4. Strongly agree
4. Every member of your cooperative can tell when the fish is mature enough to be harvested.
 1. Strongly disagree
 2. Disagree
 3. Agree
 4. Strongly agree
5. Every member of your cooperative knows enough about fish farming in such a way he (she) can do without the extensionist assistance.
 1. Stronglgy disagree
 2. Disagree
 3. Agree
 4. Strongly agree
6. Every member of your cooperative can produce and maintain your the seed-stock.
 1. Strongly disagree
 2. Disagree
 3. Agree
 4. Strongly agree

Membership Characteristics:

1. How many members are in your cooperative

Number: _____

2. All members of your cooperative are the same sex:

1. Yes 2. No

2.1. If No, indicate how many are:

2.1.1. Male: _____

2.1.2. Female: _____

3. All members of your cooperative are of the same age group:

1. Yes 2. No

3.1. If No, indicate how many are:

3.1.1. Young (15-25 years old): _____

3.1.2. Middle age (26-45 years old): _____

3.1.3. Older people (46 and older): _____

4. All members of your cooperative are of the same marital status:

1. Yes 2. No

4.1. If No, indicate how many are:

4.1.1. Single: _____

4.1.2. Married: _____

4.1.3. Widowed: _____

4.1.4. Divorced: _____

5. Indicate how many members of your cooperative are personal friends:

1. None: _____

2. Few: _____

3. Most: _____

4. All: _____

6. Indicate how many members of your cooperative have family relationships:

- 1. None: _____
- 2. Few: _____
- 3. Most: _____
- 4. All: _____

Leadership:

The following are statements about the leadership style in your cooperative. Which one describes best your response?

1. Only group leaders (President, Vice-President, Secretary, and Treasurer) make decisions on the date at which every member of group is to report to the pond to feed the fish.

- 1. Never
- 2. Rarely
- 3. Sometimes
- 4. Often
- 5. Always

2. Only the group leaders make decisions on who does which operation.

- 1. Never
- 2. Rarely
- 3. Sometimes
- 4. Often
- 5. Always

3. Only group leaders decide on the date to harvest.

- 1. Never
- 2. Rarely
- 3. Sometimes
- 4. Often
- 5. Always

4. Only the group's leaders decide whether to restock the pond immediately after harvesting or not.

- 1. Never
- 2. Rarely
- 3. Sometimes
- 4. Often
- 5. Always

Cooperative Education:

1. Is there any cooperative organizer in your commune?

1. Yes 2. NO

1.1. If Yes, how often does he (she) visit your cooperative?

1. Never
2. Once a week
3. Once a month
4. Once a term
5. Once a semester
6. Once a year

2. Has any one in your cooperative been in training at IWACU center?

1. Yes 2. No

2.1. If Yes,

How Many: _____

Cooperative Experience:

1. How long have you and your peers been doing fish farming as a cooperative?

1. 1 year or less
2. 2-4 years
3. 5-6 years
4. 7-8 years

2. How long have you been together as a cooperative including the time before doing fish farming?

Number of years: _____

3. Besides fish farming is there any other activity is your cooperative engaged in?

1. Yes 2. No

3.1. If Yes, indicate what activity:

1. Growing crops: _____
2. Cattle raising: _____
3. Craft: _____
4. Small industry
(brick or tile making): _____

Feedback and Self-reevaluation:

1. How often does the General Assembly of all members of your cooperative holds meetings? (Answer by chosing one of the following):

1. Once a week
2. Once a month
3. Once a term
4. Once a semester
5. Once a year

2. Does your cooperative have a Control and Supervision Board?

1. Yes
2. No

3. If yes, how often does the board submit report to the General Assembly? (Answer by chosing one of the following):

1. Never
2. Once a week
3. Once a month
4. Once a term
5. Once a semester
6. Once a year

Diffusion of fish farming technical knowledge:

1. Each group member has one specific task (either feeling pond with water, or fertilizing the pond, feeding fish, cutting grass around pond, etc) he (she) has to do in the group:

1. Yes
2. No

2. Every member in your cooperative basically gets to do all operations at different times, on a rotational basis. (Answer by chosing one of the following):

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly agree

Equal Treatment (Proper Incentives):

1. When a member is sick or cannot do his (her) work for one reason or another, what does he (she) do to compensate for lack of labor contributions?
 1. Monetary compensation
 2. Replacement by a family member
 3. Allowed to do it at another time

APPENDIX C
MAP OF RWANDA

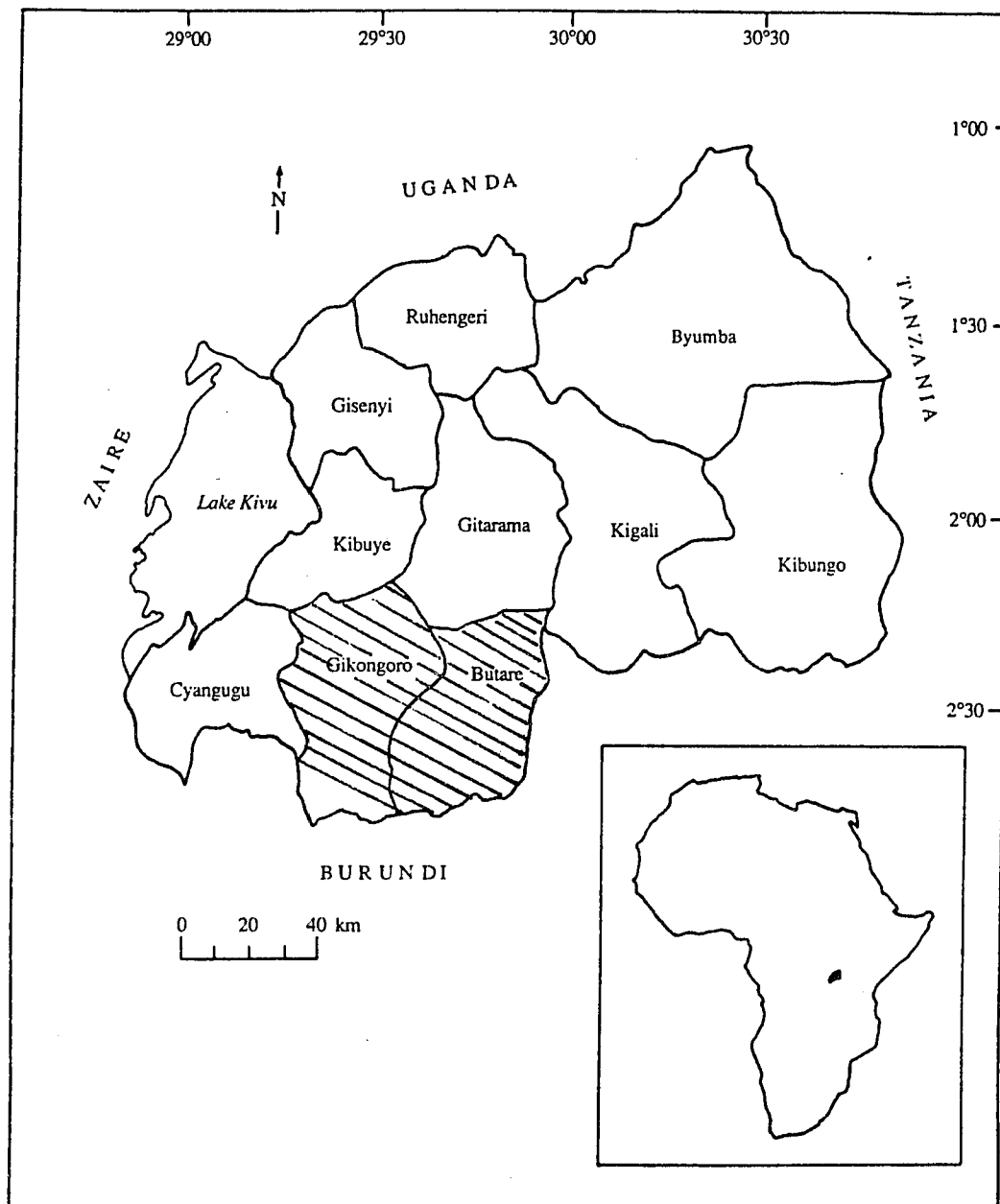


Figure 1. The republic of Rwanda.

The hatched area represents the prefectures
of Butare and Gikongoro.

VITA

The author was born on January 23, 1960, in Nyamyumba, a rural area located in the prefecture of Gisenyi, in northwest Rwanda.

He received his primary education at "Ecole Primaire de Nyanza," between 1966 and 1972. From 1972 to 1979, he attained his secondary education at "Petit Séminaire de Butare." In 1979, he enrolled at " Université Nationale du Rwanda" where he graduated in 1982, with a Bachelor's degree in Social Sciences.

Between 1982 and 1984, he taught in secondary school at Rambura and Nyundo.

In 1985, he left his country to pursue graduate studies at Louisiana State University, Baton Rouge, USA, with a scholarship offered by the African-American Institute. He was granted a Master's degree in Sociology in May 1997.

In January 1988, he was offered an assistantship and began his doctoral studies in the Department of Sociology at Louisiana State University, Baton Rouge. In January 1991, he was granted a "Rockefeller Foundation Dissertation Internship Award" to do field research in Rwanda where he investigated the factors of performance of fish farm cooperatives.

He is a candidate for the Ph.D. in Sociology.


DOCTORAL EXAMINATION AND DISSERTATION REPORT

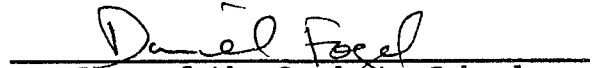
Candidate: Alphonse Rubagumya

Major Field: Sociology


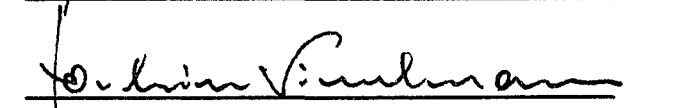
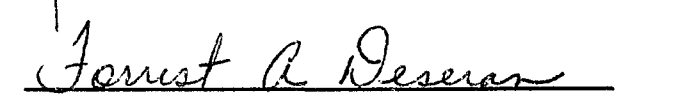
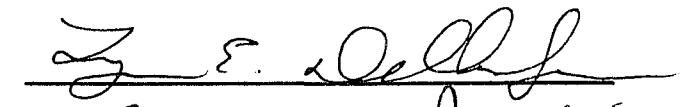
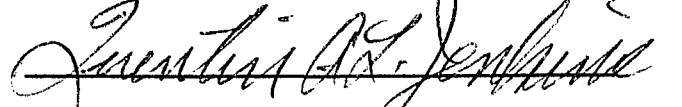

Title of Dissertation: The Dynamics of Collective Farming:
A Case Study of Fish Farm Cooperatives in
the Prefectures of Butare and Gikongoro, Rwanda.

Approved:


Major Professor and Chairman


Dean of the Graduate School

EXAMINING COMMITTEE:

Date of Examination:

November 19, 1992